These degree programme and examination regulations have been worded carefully to be up to date; however, errors cannot be completely excluded. The official German text available from L 1 – Office of Legal Affairs and Academic Quality Management is the version that is legally binding.

Degree Programme and Examination Regulations for the Bachelor’s and Master’s Degree Programme in Data Science at the Faculty of Sciences at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) – FPODataScience –
Dated 20 August 2020

Based on Section 13 (1)(2), Section 43 (5)(2), Section 58 (1) and Section 61 (2)(1) of the Bavarian Higher Education Act (Bayerisches Hochschulgesetz, BayHSchG), FAU enacts the following degree programme and examination regulations:

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Part I: General Provisions

Section 37 Scope
The degree programme and examination regulations for the Bachelor’s degree programme and consecutive Master’s degree programme in Data Science supplement the current version of the general degree programme and examination regulations for the Bachelor’s degree programmes in Data Science, Mathematics, Industrial Mathematics and Economics and Mathematics as well as the Master’s degree programmes in Data Science, Mathematics, Computational and Applied Mathematics and Economics and Mathematics at the Faculty of Sciences at FAU – ABMPOMathe/NatFak –.

Section 38 Bachelor’s Degree Programme, Standard Duration of Studies, Related Degree Programmes
(1) The Bachelor’s degree programme in Data Science consists of modules worth 180 ECTS credits distributed over six semesters. This includes the period for working on the Bachelor’s thesis.

(2) Bachelor’s degree programmes count as related degree programmes pursuant to Section 26 (1)(2)(2) ABMPOMathe/NatFak if at least 65 ECTS credits are allocated to mathematics in the curriculum of the degree programme, and the degree programme also includes at least 55 ECTS credits from computer sciences.

Section 39 Master’s Degree Programme, Standard Duration of Studies, Teaching Language, Related Degree Programmes
(1) The Master’s degree programme in Data Science builds on the content covered in the Bachelor’s degree programme in Data Science. It consists of modules worth 120 ECTS credits including the Master’s thesis, distributed over four semesters.

(2) Master’s degree programmes count as related degree programmes pursuant to Section 32 (2)(2) ABMPOMathe/NatFak if at least 80 ECTS credits are allocated to mathematics in the curriculum of the degree programme, and 30 ECTS credits are included from computer science.

(3) The teaching and examination language for the Master’s degree programme in Data Science is German for the specialisations Mathematical theory/foundations of data science (MTG) and Mathematical statistical data analysis (MSD). The teaching and examination language in the specialisations Data-based optimization (DO), Data bases and knowledge representation (DW), Machine learning/artificial intelligence (AI), and Simulation and numerics (SN) is English. Individual modules in the specialisations mentioned in sentences 1 and 2 can also be held in the other language; Section 4 (5) ABMPOMathe/NatFak shall remain unaffected.

Part II: Special Provisions

1. Bachelor’s Examination

Section 40 Structure of the Bachelor’s Degree Programme
The Bachelor’s degree programme consists of:
   a) compulsory modules for data science (nos. 1 and 2 and nos. 5 to 15),
   b) compulsory elective modules for
the core modules in data science (nos. 3 and 4 pursuant to Section 42),
compulsory electives in mathematics (no. 16 pursuant to Section 43),
compulsory electives in computer science (no. 17 pursuant to Section 44),
specialisations (no. 18 and 19 pursuant to Section 45), and
the application field (no. 20 pursuant to Section 46),
c) elective modules for technical and non-technical key qualifications (no. 21 pursuant to Section 47) as well as
d) Bachelor’s seminar and Bachelor’s thesis (nos. 22 and 23 pursuant to Section 48).
\(^2\)Details are set forth hereinafter and in Appendix 1.

Section 41 Grundlagen- und Orientierungsprüfung (GOP)
In order to pass the Grundlagen- und Orientierungsprüfung (GOP), students must acquire a minimum of 30 ECTS credits from the foundation modules in mathematics and computer science.

Section 42 Compulsory Elective Modules for Core Modules in Data Science
(1) The core modules in data science consist of the compulsory modules no. 1 and no. 2 and the compulsory elective modules no. 3 and no. 4 pursuant to Appendix 1b.  
\(^2\)Students must acquire a total of 20 ECTS credits in the core modules in data science.

(2) Students choose compulsory elective modules no. 3 and no. 4 by registering for the first examination in a module from the group of compulsory elective modules.  
\(^2\)The modules are listed in module catalogues that are announced in accordance with local practice at the latest one week before the semester begins.  
\(^3\)Changes to the module catalogues can be made by the Examinations Committee, to take effect from the following semester.

(3) The type and scope of the examinations and the way in which the grade is determined for the compulsory elective modules for the core modules in data science depend on the specific manner in which the respective modules are taught; see module handbook for details.  
\(^2\)Possible examination achievements for modules offered by the Department of Mathematics as compulsory elective modules for the core modules in data science are as follows:
1. Written examination (60-120 min),
2. Written assignment (approx. 5-10 pages),
3. Report (approx. 5-10 pages),
4. Oral examination (15-30 min),
5. Electronic examination (e-examination 30-60 min),
6. Tutorial achievement (approx. 30-45 pages),
7. Practical achievement (report approx. 5-10 pages or series of reports approx. 40 pages),
8. Seminar achievement (presentation 30-80 min), possibly with written assignment (approx. 5-10 pages),
9. Excursion achievement (report approx. 5-10 pages or series of reports approx. 30-45 pages)
and combinations of the above.  
\(^3\)In particular in the cases covered by Section 6 (2)(3) ABMPOMathe/NatFak, it is possible to combine a written or oral examination with achievements as set forth in Section 6 (4) ABMPOMathe/NatFak.  
\(^4\)Further details are stipulated in the module handbook.  
\(^5\)The type and scope of examinations and the way in which the grade is determined for the compulsory elective modules for the core modi-
ules in data science from other departments and faculties depend on the specific manner in which the modules are taught; see the relevant (degree programme) and examination regulations and/or the module handbook for details.

(4) ¹Modules from the Department of Mathematics amounting to 5 ECTS credits usually consist of lectures (2 SWS) and tutorials (up to 2 SWS) or seminars (2 SWS). ²Modules from the Department of Mathematics amounting to 10 ECTS credits usually consist of lectures (4 SWS) and tutorials (up to 3 SWS). ³Any exceptions are detailed in the module handbook. ⁴Modules from other departments and faculties may deviate from the provisions stipulated in sentences 1 and 2. ⁵Further details are stipulated in the respective degree programme and examination regulations and/or the module handbook.

Section 43 Compulsory Elective Modules in Mathematics
(1) ¹The compulsory elective modules in mathematics (no. 16 pursuant to Appendix 1b) account for between 5 and 15 ECTS credits. ²Together with the compulsory elective modules in computer science, students must take modules coming to a total of 20 ECTS credits.

(2) ¹The learning outcome of the compulsory elective modules in mathematics is to allow students to gain a more in-depth knowledge of selected mathematical skills. ²The second learning outcome has a research focus, with students learning subject-related methods of research and exploring their subject in more depth. ³Thirdly, the element of choice allows students to tailor their profile in view of the area of data science they intend to specialise in.

(3) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing the available modules.

(4) The type and scope of teaching units and the examination are stipulated in Section 42 (3) and (4).

Section 44 Compulsory Elective Modules in Computer Science
(1) ¹The compulsory elective modules in computer science (no. 17 pursuant to Appendix 1b) account for between 5 and 15 ECTS credits. ²Together with the compulsory elective modules in mathematics, students must take modules amounting to a total of 20 ECTS credits.

(2) ¹The learning outcome of the elective modules in computer science is firstly to allow students to acquire skills in a specific area of computer science. ²The second learning outcome has a research and practical focus, with students learning subject-related methods of research and practical application, and exploring their subject in more depth. ³Thirdly, the element of choice allows students to tailor their profile in view of the area of data science they intend to specialise in.

(3) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing the available modules.

(4) The type and scope of teaching units and the examination are stipulated in Section 42 (3)(5) and (4)(4).
Section 45 Compulsory Elective Modules in Specialisations

(1) The compulsory elective modules in the specialisations (nos. 18 and 19 in Appendix 1b) are specifically aimed at allowing students to acquire more extensive skills in specific areas of mathematics and computer science. The learning outcome has a research and practical focus, with students learning subject-related methods of research and exploring their subject in more depth. The element of choice gives students the opportunity to tailor their profile in view of a subsequent Master’s degree or their future career.

(2) At least 30 ECTS credits must be obtained in the specialisations. Students choose to specialise in mathematics, computer science or an interdisciplinary specialisation. Students shall acquire a minimum of 15 ECTS credits and a maximum of 20 ECTS credits from the chosen specialisation. The remaining 10 to 15 ECTS credits shall be submitted from the specialisations that were not chosen. Students shall take at least 10 ECTS credits in specialisation modules offered by the Department of Mathematics and the Department of Computer Science respectively.

(3) The specialisations (modules nos. 18 and 19 pursuant to Appendix 1b) are offered by different departments and consist of module packages. The following specialisations are available for mathematics:
   a) Mathematical statistical data analysis (MSD)
   b) Data-oriented optimisation (DO)
   c) Mathematical theory/foundations of data science (MTG).

The following specialisations are available for computer science:
   a) Databases and knowledge representation (DW)
   b) Machine learning / artificial intelligence (AI).

Students may also choose the interdisciplinary specialisation Simulation and numerics (SN).

(4) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing available modules.

(5) The type and scope of teaching units and the examination are stipulated in Section 42 (3) and (4).

Section 46 Compulsory Elective Modules for Application Field

(1) The application field (no. 20 pursuant to Appendix 1b) accounts for 10 ECTS credits. The following application fields may be chosen:
   1. Chemistry
   2. Digital humanities
   3. Geography
   4. Geosciences
   5. Medical data science
   6. Physics
   7. Materials science
   8. Information systems.

The Examinations Committee can approve additional application fields upon request.

(2) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing available modules.
(3) The type and scope of teaching units and the examination are stipulated in Section 42 (3)(5) and (4)(4).

**Section 47 Elective Modules for Technical and Non-Technical Key Qualifications**

(1) Module no. 20 pursuant to Appendix 1b comprises elective modules for technical and non-technical key qualifications. Technical key qualifications may be selected from the following modules:
1. Selected modules from computer science,
2. Selected modules from mathematics,
3. Working as a tutor in mathematics or computer science for two semesters after participating in the relevant tutor training course,
4. Completing an internship approved by the Examinations Committee lasting (a minimum of) four weeks.

The non-technical key qualification modules are listed in a module catalogue that is announced in accordance with local practice at the latest one week before the semester begins.

Changes to the module catalogue can be made by the Examinations Committee, to take effect from the following semester.

(2) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing the modules students can choose from.

(3) The type and scope of teaching units and the examination are stipulated in Section 42 (3) and (4).

**Section 48 Bachelor’s Seminar and Bachelor’s Thesis**

(1) Specialist knowledge and skills relating to one specialist area of data science are acquired during a Bachelor’s seminar worth 5 ECTS credits. The subject of this Bachelor’s seminar can be taken as the basis for the Bachelor’s thesis, worth 10 ECTS credits, which is generally supervised by the person responsible for teaching the Bachelor’s seminar.

(2) Notwithstanding Section 29 (2) ABMPOMathe/NatFak, university lecturers employed full time at the Department of Computer Science are entitled to assign Bachelor’s theses (supervisors). Any exceptions are decided by the Examinations Committee.

2. Master’s Examination

**Section 49 Qualification for a Master’s Degree, Certificates and Admission Requirements**

(1) A subject-specific degree according to Section 31 (1)(1)(1) ABMPOMathe/NatFak is a Bachelor’s degree or a Diplom degree in the subjects mathematics, industrial mathematics, economics and mathematics, or data science. In particular, Bachelor’s degrees in physics, engineering or computer science that cover mathematical topics accounting for at least 45 ECTS credits shall be recognised as subject-related degrees within the meaning of Section 31 (1)(1)(1) ABMPOMathe/NatFak. Applicants with a subject-related degree shall only be admitted to the Master’s degree programme after passing an oral admission examination pursuant to Section 5 (4) of the Appendix ABMPOMathe/NatFak.
(2) ¹Additional proof that must be submitted as stipulated in Section 2 (2)(3) of the Appendix ABMPOMathe/NatFak shall be proof of language proficiency of at least English Level B 2 (Common European Framework of Reference for Languages – CEFR) Vantage or Upper Intermediate; evidence of this can be provided, in particular, by having participated in English lessons for 6 years at a German grammar school (Gymnasium). ²Applicants who have completed their university entrance qualifications or their first degree in English are not required to provide proof of proficiency in English.

(3) In the oral admission examination according to Section 5 (3) et seq. of the Appendix ABMPOMathe/NatFak, applicants shall be evaluated according to the following criteria:
1. Quality of basic knowledge in numerics, optimisation or stochastics/statistics (35 %)
2. Quality of basic knowledge in algorithms and data structure (35 %)
3. Ability to discuss mathematical topics in English, e.g. the content of their Bachelor’s thesis (30 %).

Section 50 Content, Scope and Structure of the Master’s Degree Programme
(1) ¹The Master’s degree programme shall consist of the modules set forth in Appendix 2. ²A total of 120 ECTS credits must be obtained during the Master’s degree programme as follows:
1. 20 ECTS credits from compulsory modules (nos. 1 to 3 and 8),
2. 30 ECTS credits from compulsory elective modules from major subject (no. 4 pursuant to (2) in conjunction with Section 51),
3. 20 ECTS credits from compulsory elective modules in minor subjects (no. 5 pursuant to (2) in conjunction with Section 51),
4. 15 ECTS credits from compulsory elective modules from the application field (no. 6 pursuant to Section 52),
5. 5 ECTS credits from elective modules from technical key qualifications (no. 7 pursuant to Section 53),
6. A Master’s seminar amounting to 5 ECTS credits from the modules offered by the Department of Mathematics or the Department of Computer Science,
7. 30 ECTS credits from the Master’s thesis in the main field of study.

(2) ¹The Master’s degree programme in Data Science is taken in one of the following specialisations.
1. Data-oriented optimisation (DO),
2. Mathematical theory/foundations of data science (MTG),
3. Databases and knowledge representation (DW),
4. Machine learning/artificial intelligence (AI),
5. Simulation and numerics (SN),
6. Mathematical statistical data analysis (MSD).
²Applicants state their chosen specialisation in their application for admission to the Master’s degree programme, but this can be changed over the course of the degree programme. ³The chosen specialisation shall be referred to as the major field of study, the specialisations that are not chosen shall be referred to as minor fields of study. ⁴Students shall take at least 20 ECTS credits in specialisation modules offered by the Department of Mathematics and the Department of Computer Science respectively.
Section 51 Compulsory Elective Modules in Specialisations

(1) 1In the compulsory elective modules in the specialisations, students acquire skills in scientific methods for classifying mathematical structures, for modelling and for problem-solving strategies, and the ability to carry out academic work independently. 2The learning outcome has a research focus, with students learning subject-related methods of research and exploring their subject in more depth. 3The element of choice allows students to tailor their profile in view of their career plans.

(2) The specialisations have the following subject-specific learning outcomes:
1. In the specialisation Data-oriented optimisation (DO), students acquire methodological skills covering various aspects of this field of study such as linear and non-linear systems, and combinatorial, non-linear or robust optimisation.
2. In the specialisation Mathematical theory/foundations of data science, students acquire methodological skills covering various aspects of this field of study such as differential equations and algebra.
3. In the specialisation Databases and knowledge representation, students acquire methodological skills covering various aspects of this field of study such as data management in distributed systems, data warehouse systems, big data technology, and semantic web technologies.
4. In the specialisation Machine learning/artificial intelligence, students acquire methodological skills covering various aspects of this field of study such as symbolic and non-symbolic AI, supervised and non-supervised learning, deep learning.
5. In the specialisation Simulation and numerics in data science, students acquire methodological skills covering various aspects of this field of study such as simulation, modelling, scientific computing or numerical methods for partial differential equations.
6. In the specialisation Mathematical statistical data analysis in data science, students acquire methodological skills covering various aspects of this field of study such as statistics, stochastics, image and data analysis or risk data analytics.

(3) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing the modules students can choose from.

(4) The type and scope of teaching units and the examination are stipulated in Section 42 (3) and (4).

Section 52 Compulsory Elective Modules for Application Field

(1) 1The application field (no. 6 pursuant to Appendix 2b) accounts for 15 ECTS credits. 2The following application fields may be chosen:
  1. Chemistry
  2. Digital humanities
  3. Geography
  4. Geoscience
  5. International information systems
  6. Medical data science
  7. Physics
3The Examinations Committee can approve additional application fields upon request.

(2) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing the modules students can choose from.
(3) The type and scope of teaching units and the examination are stipulated in Section 42 (3)(5) and (4)(4).

Section 53 Elective Modules for Technical Key Qualifications

(1) Module no. 7 pursuant to Appendix 2b comprises elective modules for technical key qualifications. Technical key qualifications may be selected from the following modules:
1. Selected modules from computer science.
2. Selected modules from mathematics.
3. Working as a tutor in mathematics or computer science for two semesters after participating in the relevant tutor training course.
4. Completing an internship approved by the Examinations Committee lasting (a minimum of) four weeks.

(2) Section 42 (2) shall apply accordingly with respect to registering for the examination and announcing the modules students can choose from.

(3) The type and scope of teaching units and the examination are stipulated in Section 42 (3) and (4).

Section 54 Mentoring and Individual Study Agreement

(1) Each student is assigned a mentor upon commencing the Master’s degree programme. The mentor is responsible for assisting the student in drawing up an individual study agreement and answering any questions students may have concerning their degree programme. This mentoring relationship shall be maintained throughout the Master’s degree programme. Applicants may suggest a mentor when applying to be admitted to the Master’s degree programme.

(2) At the beginning of the Master’s degree programme, the mentor and the student shall work together to draw up an individual study agreement which should take the specific subject areas the student is interested in into account. This study agreement shall remain valid for the duration of the Master’s degree programme and shall list all the modules which are to be taken. It shall be submitted to the Examination Office for approval by the date of the first examination in the Master’s degree programme.

(3) The study agreement may be updated in consultation with the mentor if necessary in order to ensure that the subject area suits the individual focus chosen by the student and can be studied accordingly. The updated version shall be submitted to the Examination Office for approval without delay.

Section 55 Master’s Thesis

(1) The Master’s thesis is intended to demonstrate students’ ability to solve scientific problems in the field of data science. Requirements for the thesis shall be such that it can completed within a period of six months.

(2) Notwithstanding Section 34 (3) ABMPOMathe/NatFak, university lecturers employed full time at the Department of Computer Science are entitled to assign Bachelor’s theses (supervisors). Any exceptions are decided by the Examinations Committee.
(3) The Master's thesis shall usually deal with a scientific subject from the chosen branch of study.

(4) 30 ECTS credits shall be awarded for the Master's thesis.

Part III: Final Provisions

Section 56 Legal Validity

¹These examination regulations shall come into effect on the day after their publication.
²They shall apply to all students who start the Bachelor's or Master's degree programme in Data Science in the winter semester 2020/2021 or later.
Appendix 1: Bachelor’s degree programme in Data Science

Appendix 1a: Overview of Curriculum

<table>
<thead>
<tr>
<th>Core modules: Data science 20 ECTS credits</th>
<th>Bachelor’s thesis (6th semester) 15 ECTS credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application field (5th and 6th semesters) 10 ECTS credits</td>
<td>Specialisations (5th and 6th semesters) 30 ECTS credits</td>
</tr>
<tr>
<td>Compulsory elective modules mathematics (4th semester) 5 - 15 ECTS</td>
<td>Compulsory elective modules computer science (4th semester) 5 - 5 ECTS</td>
</tr>
<tr>
<td>Intermediate modules in mathematics and computer science (3rd and 4th semesters) 30 ECTS credits</td>
<td>Intermediate modules in mathematics and computer science (1st and 2nd semesters) 40 ECTS credits</td>
</tr>
<tr>
<td>Technical and non-technical key qualifications 15 ECTS</td>
<td></td>
</tr>
</tbody>
</table>

The regulations for the coloured blocks are explained in detail in the example degree programme structure below (see Appendix 1b).
### Appendix 1b: Study Plan for the Bachelor’s Degree Programme in Data Science

<table>
<thead>
<tr>
<th>No.</th>
<th>Module name</th>
<th>Teaching unit</th>
<th>SWS (semester hours)</th>
<th>Total ECTS credits</th>
<th>Distribution of workload per semester in ECTS credits</th>
<th>Type and scope of the examination/course achievement</th>
<th>Grade factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seminar: Data science in research and industry</td>
<td>Seminar: Data science in research and industry</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>Written examination with multiple choice 90 min</td>
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<tr>
<td>2</td>
<td>Introduction to mathematical data analysis</td>
<td>Lecture: Introduction to mathematical data analysis</td>
<td>2</td>
<td></td>
<td>5</td>
<td>Written examination 60 min</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tutorial: Introduction to mathematical data analysis</td>
<td>1</td>
<td></td>
<td>5</td>
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<tr>
<td>3</td>
<td>Compulsory elective modules from the catalogue for machine learning</td>
<td>see module catalogue pursuant to Section 42 (4)</td>
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<td>5</td>
<td>see module catalogue pursuant to Section 42 (3)</td>
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<td></td>
<td>from the catalogue for machine learning pursuant to Section 42</td>
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<td>4</td>
<td>Compulsory elective modules from the catalogue for data science project</td>
<td>see module catalogue pursuant to Section 42 (4)</td>
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<td>5</td>
<td>see module catalogue pursuant to Section 42 (3)</td>
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<td></td>
<td>from the catalogue for data science project pursuant to Section 42</td>
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<td><strong>Total for core modules: Data science</strong></td>
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<tr>
<td>No.</td>
<td>Module name</td>
<td>Teaching unit</td>
<td>SWS (semester hours)</td>
<td>Total ECTS credits</td>
<td>Distribution of workload per semester in ECTS credits</td>
<td>Type and scope of the examination/course achievement</td>
<td>Grade factor</td>
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<tr>
<td>5</td>
<td>Mathematics for data science 1 GOP¹</td>
<td>Lecture: Data science 1</td>
<td>L: 4</td>
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<td>Written examination 120 min and tutorial achievement (un-graded)</td>
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<td>S: 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>Mathematics for data science 2 GOP¹</td>
<td>Lecture: Data science 2</td>
<td>L: 4</td>
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<td></td>
<td>Written examination 120 min and tutorial achievement (un-graded)</td>
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<td></td>
<td></td>
<td>Tutorial: Data science 2</td>
<td>T: 2</td>
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<tr>
<td></td>
<td></td>
<td>Blackboard exercise: Data science 2</td>
<td>S: 2</td>
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<tr>
<td>7a</td>
<td>Lecture: Algorithms and data structures for medical engineers (GOP¹, only applicable in conjunction with 7b)</td>
<td>see FPOMT</td>
<td>L: 5</td>
<td></td>
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<tr>
<td>7b</td>
<td>Tutorial on algorithms and data structures for medical engineers (GOP¹, only applicable in conjunction with 7a)</td>
<td>see FPOMT</td>
<td>L: 5</td>
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<td>8</td>
<td>Conceptual modelling GOP¹</td>
<td>see FPOINF</td>
<td>L: 5</td>
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<td>9</td>
<td>Parallel and functional programming GOP¹</td>
<td>see FPOINF</td>
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<td>Total foundation modules in mathematics and computer science</td>
<td></td>
<td></td>
<td>16</td>
<td>16 0 0 0 0 0 40 20 20 0 0 0 0 0 0</td>
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</table>

¹ In order to pass the Grundlagen- und Orientierungsprüfung (GOP), students must acquire a minimum of 30 ECTS credits from the foundation modules in mathematics and computer science.
<table>
<thead>
<tr>
<th>No.</th>
<th>Module name</th>
<th>Teaching unit</th>
<th>SWS (semester hours)</th>
<th>Total ECTS credits</th>
<th>Distribution of workload per semester in ECTS credits</th>
<th>Type and scope of the examination/course achievement</th>
<th>Grade factor</th>
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<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td>1st sem.</td>
<td>2nd sem.</td>
<td>3rd sem.</td>
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<tr>
<td>10</td>
<td>Linear and combinatorial optimisation²</td>
<td>see FPOWiMathe</td>
<td>10</td>
<td>10</td>
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<td></td>
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<tr>
<td>11</td>
<td>Introduction to numerics²</td>
<td>see FPOTechnoMathe</td>
<td>10</td>
<td>10</td>
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<td>12</td>
<td>Stochastic modelling²</td>
<td>see FPOWiMathe</td>
<td>10</td>
<td>10</td>
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<tr>
<td>13</td>
<td>Information visualisation³</td>
<td>Information visualisation</td>
<td>2</td>
<td>5</td>
<td>5</td>
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<tr>
<td>14</td>
<td>Knowledge discovery in databases and transaction systems³</td>
<td>see Section 39a FPOINF</td>
<td>5</td>
<td>5</td>
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<td>15</td>
<td>Foundations of logic in computer science³</td>
<td>see FPOINF</td>
<td>5</td>
<td>5</td>
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<td>Module name</td>
<td>Teaching unit</td>
<td>SWS (semester hours)</td>
<td>Total ECTS credits</td>
<td>Distribution of workload per semester in ECTS credits</td>
<td>Type and scope of the examination/course achievement</td>
<td>Grade factor</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>S</td>
<td>T</td>
</tr>
<tr>
<td>16</td>
<td>Compulsory elective modules in mathematics</td>
<td>see module catalogue pursuant to Section 43 (4)</td>
<td>5-15</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Compulsory elective modules in computer science</td>
<td>see module catalogue pursuant to Section 44 (4)</td>
<td>5-15</td>
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<td>17</td>
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<td>see module catalogue pursuant to Section 44 (4)</td>
<td>5-15</td>
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<tr>
<td>18</td>
<td>Compulsory elective modules for chosen specialisation</td>
<td>see module catalogue pursuant to Section 45 (5)</td>
<td>15-20</td>
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<td></td>
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<tr>
<td>19</td>
<td>Compulsory elective modules for specialisations not chosen</td>
<td>see module catalogue pursuant to Section 45 (5)</td>
<td>10-15</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total for computer science specialisation</td>
<td>12</td>
<td>8</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

4 Students must take at least one module worth 5 ECTS credits and may only take modules worth a maximum of 15 ECTS credits from the compulsory elective modules in mathematics and computer science. Students must take compulsory elective modules in mathematics and computer science amounting to a total of 20 ECTS credits.

5 Students shall take at least 10 ECTS credits in specialisation modules offered by the Department of Mathematics and the Department of Computer Science respectively.
<table>
<thead>
<tr>
<th>No.</th>
<th>Module name</th>
<th>Teaching unit</th>
<th>SWS (semester hours)</th>
<th>Total ECTS credits</th>
<th>Distribution of workload per semester in ECTS credits</th>
<th>Type and scope of the examination/course achievement</th>
<th>Grade factor</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L  T  P  S  T</td>
<td>1st sem.</td>
<td>2nd sem.</td>
<td>3rd sem.</td>
<td>4th sem.</td>
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<tr>
<td>20</td>
<td>Compulsory elective modules from the catalogue for the application field pursuant to Section 46</td>
<td>see module catalogue pursuant to Section 46 (3)</td>
<td>10</td>
<td>5</td>
<td>5</td>
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<td></td>
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<tr>
<td></td>
<td><strong>Total: Application field</strong></td>
<td></td>
<td><strong>2 4 8 0 0 10</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>Technical and non-technical key qualifications (pursuant to Section 47)</td>
<td>see module catalogue pursuant to Section 47 (3)</td>
<td>15</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total technical and non-technical key qualifications</strong></td>
<td></td>
<td><strong>6 6 0 0 0 15</strong></td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>22</td>
<td>Bachelor’s seminar</td>
<td>Bachelor’s seminar (see section 48)</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>Total Bachelor’s thesis</strong></td>
<td></td>
<td><strong>0 0 2 0 15</strong></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td><strong>Total SWS (at least)</strong></td>
<td></td>
<td><strong>70 59 10 8 1</strong></td>
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</table>

Key:
Tutorial achievement: see Section 6 (4) ABMPOMathe/NatFak.

Bachelor’s seminar (approx. 20-25 pages)
Appendix 2: Master's degree programme in Data Science

Appendix 2a: Overview of Curriculum

<table>
<thead>
<tr>
<th>Core modules: Data science 15 ECTS credits</th>
<th>Major field of study 30 ECTS credits</th>
<th>Minor fields of study 20 ECTS credits</th>
<th>Application field 15 ECTS credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master's Thesis 30 ECTS credits</td>
<td>Master's seminar 5 ECTS credits</td>
<td>Technical key qualifications 5 ECTS credits</td>
<td></td>
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</table>
### Appendix 2b: Study Plan for the Master's Degree Programme in Data Science

<table>
<thead>
<tr>
<th>No.</th>
<th>Module name</th>
<th>Teaching unit</th>
<th>1st sem.</th>
<th>2nd sem.</th>
<th>3rd sem.</th>
<th>4th sem.</th>
<th>Type and scope of the examination/course achievement</th>
<th>Grade factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SWS (semester hours)</td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>S</td>
<td>Total ECTS credits</td>
<td>Distribution of workload per semester in ECTS credits</td>
</tr>
<tr>
<td>1</td>
<td>Mathematical data science (MaDS)</td>
<td>Mathematics</td>
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<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>Practical: Mathematics</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
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<td>2</td>
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<tr>
<td>2</td>
<td>Deep learning</td>
<td>see Section 43a FPOINF</td>
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<td>3</td>
<td>3</td>
<td>Total for core modules: Data sciences</td>
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<tr>
<td>3</td>
<td>Mathematics of learning</td>
<td>Mathematics of learning</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
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<td>3</td>
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<td>2</td>
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<td>0</td>
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<td></td>
<td>Total for core modules: Data sciences</td>
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<td>15</td>
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<tr>
<td>4</td>
<td>Compulsory elective modules from the catalogue for chosen major field of study pursuant to Section 51</td>
<td>see module catalogue pursuant to Section 51 (4)</td>
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<td>10</td>
<td>10</td>
<td>0</td>
<td>see Section 51 (4)</td>
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<tr>
<td></td>
<td>Total compulsory electives in major field of study</td>
<td></td>
<td>30</td>
<td>5-15</td>
<td>5-15</td>
<td>10</td>
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<tr>
<td>5</td>
<td>Compulsory elective modules from the catalogues for not chosen minor fields of study pursuant to Section 51</td>
<td>see module catalogue pursuant to Section 51 (4)</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>see Section 51 (4)</td>
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<td>Total: Compulsory electives for minor field of study</td>
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<td>5-15</td>
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<tr>
<td>No.</td>
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<td>Teaching unit</td>
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<td>Distribution of workload per semester in ECTS credits</td>
<td>Type and scope of the examination/course achievement</td>
<td>Grade factor</td>
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<td>L T P S</td>
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<td>1st sem. 2nd sem. 3rd sem. 4th sem.</td>
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<tr>
<td>6</td>
<td>Compulsory elective modules from the catalogue of modules for the application field pursuant to Section 52</td>
<td>see module catalogue pursuant to Section 52 (3)</td>
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<td>5 0-5 5-10 0</td>
<td>see Section 52 (3)</td>
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<tr>
<td></td>
<td><strong>Total: Application field</strong></td>
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<td></td>
<td></td>
<td>15 5 0-5 5-10 0</td>
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<tr>
<td>7</td>
<td>Elective modules from technical key qualifications pursuant to Section 53</td>
<td>see module catalogue pursuant to Section 53 (3)</td>
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<td></td>
<td>0 0-5 0-5 0</td>
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<td>9</td>
<td>Master’s thesis pursuant to Section 55</td>
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<td>30</td>
<td>Master’s thesis (approx. 60 pages; 85%) and presentation with oral examination (approx. 60 + 15 min, 15%)</td>
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<td><strong>Total: Master’s thesis</strong></td>
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<td>0 0 0 30</td>
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<tr>
<td></td>
<td><strong>Total SWS (minimum) and ECTS credits</strong></td>
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<td>30 30 30 30</td>
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</table>

**Key:**
Seminar achievement: see Section 6 (4) and (5) ABMPOMathe/NatFak.
Published according to the resolution of the University Senate on 22 July 2020 and the authorisation of Vice President Prof. Dr. Friedrich Paulsen on 20 August 2020.

Erlangen, 20 August 2020

Prof. Dr. Friedrich Paulsen
Vice President People

These regulations were established on 20 August 2020 at Friedrich-Alexander-Universität Erlangen-Nürnberg and displayed for public inspection on 20 August 2020. The date of publication is 20 August 2020.