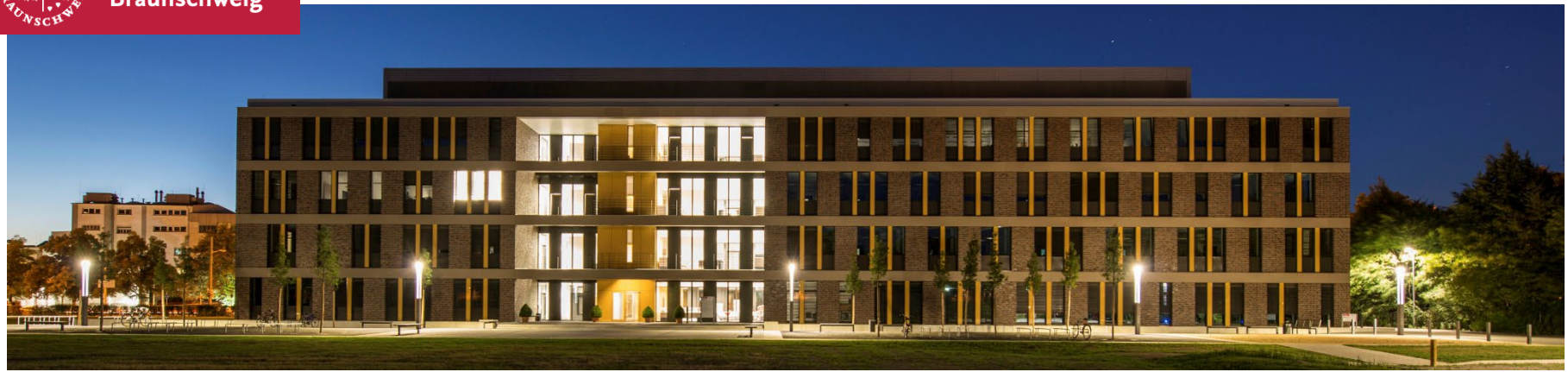


Welcome to Data Science @ TU Braunschweig!

tu-braunschweig.de/data-science

https://www.youtube.com/watch?v=vh0_IOrw3Fw

Technische Universität Braunschweig

65	Degree Programms
1.993	First Year Students
15.632	Students
120	Institutes
2.016	Researchers
244	Professors
3.799	Total Staff

cf. https://www.tu-braunschweig.de/en/tu-braunschweig/our-profile/facts-figures/translate-to-english-tu-braunschweig-in-zahlen

Europe‘s Most Active Research Region

THÜNEN

3 LANDESMUSEEN

PTB

DLR

JKI
Julius Kühn-Institut

Technische Universität Braunschweig

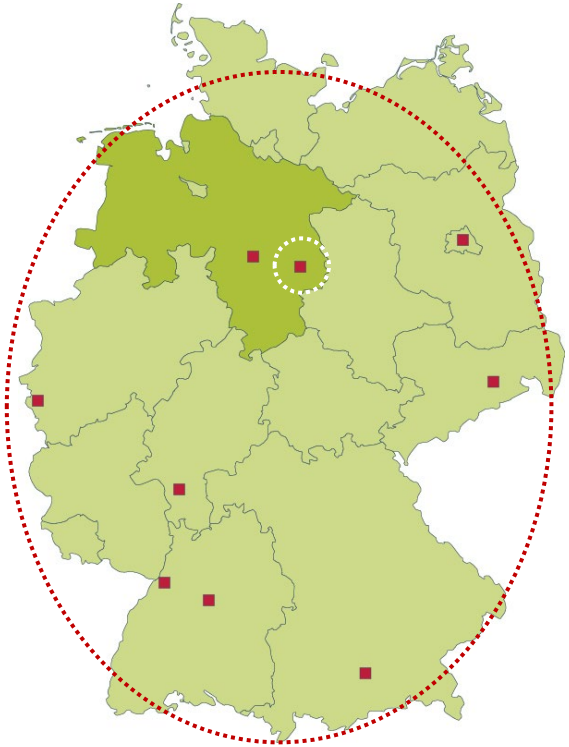
DSMZ

HERZOG AUGUST BIBLIOTHEK
WOLFENBÜTTEL

Fraunhofer

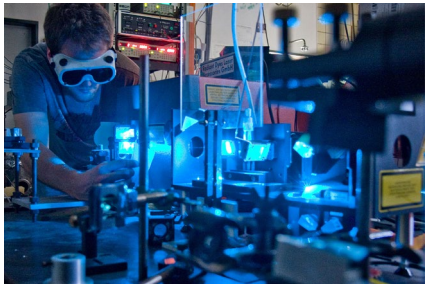
HELMHOLTZ
ZENTRUM FÜR
INFEKTIONSFORSCHUNG

GEOЯG ECKERT
INSTITUT

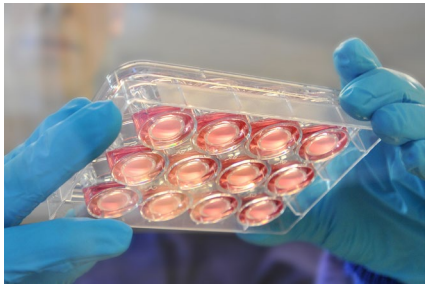


Core Research Areas @ TUBS

Mobility



Metrology



Engineering for Health

Future Cities

Data Science @ TU Braunschweig

- Foundational Master Programme in Mathematics and Computer Science
- Innovative Application Areas in Core Research Areas of TU Braunschweig
- International Master Programme – Fully taught in English
- Mentoring Concept
- Flexible Choice of Modules
- 30 – 40 Study Places per Year

Skills and Competencies

Graduates as **Master of Data Science** can

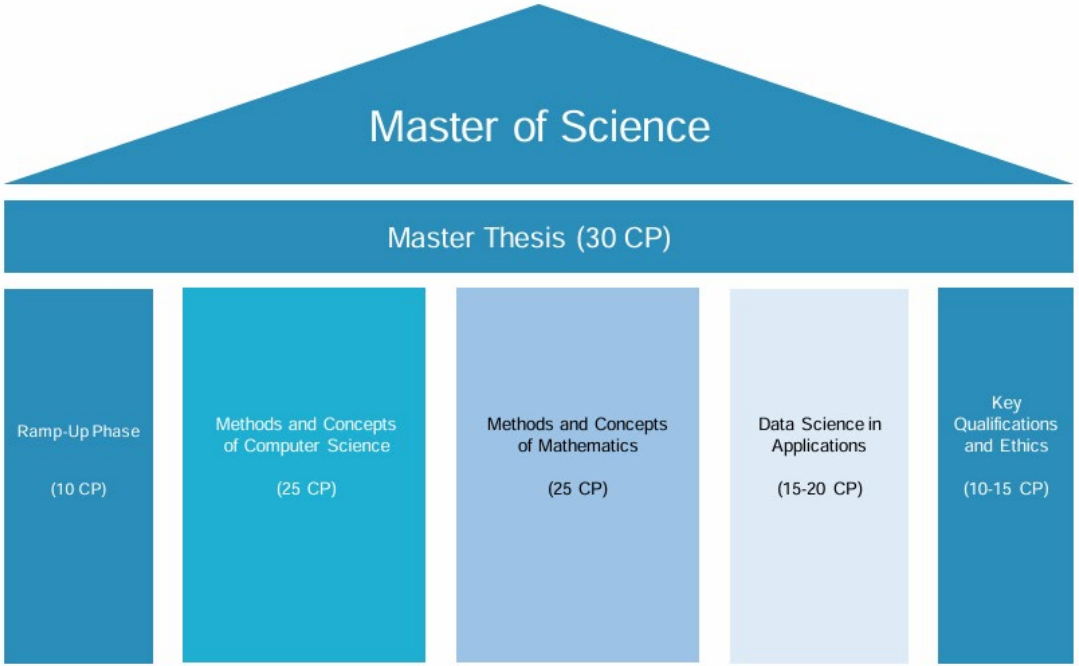
- Use Methods of Data Acquisition, Data Integration and Data Management efficiently
- Select Analysis Methods competently and adapt it to the Special Requirements of an Application
- Evaluate and assess the Expressiveness of Analysis Methods and Results
- Lead Data Projects in Companies and effectively manage Corporate Decision Processes

- **Simply: Data Science = Mathematics + Computer Science + Applications**

Design and Structure of the Study Program (120 Credits)

- 3 Core Areas:
  - **Mathematics** (25 CP)
  - **Computer Science** (25 CP)
  - **Applications** (15-20 CP)
  - **Key Qualifications** (10-15 CP)

- Application Areas:
  - Biology, Chemistry, Pharmacy
  - Medicine
  - Engineering
  - Image and Signal Processing
- Mandatory seminar
- Optional research project

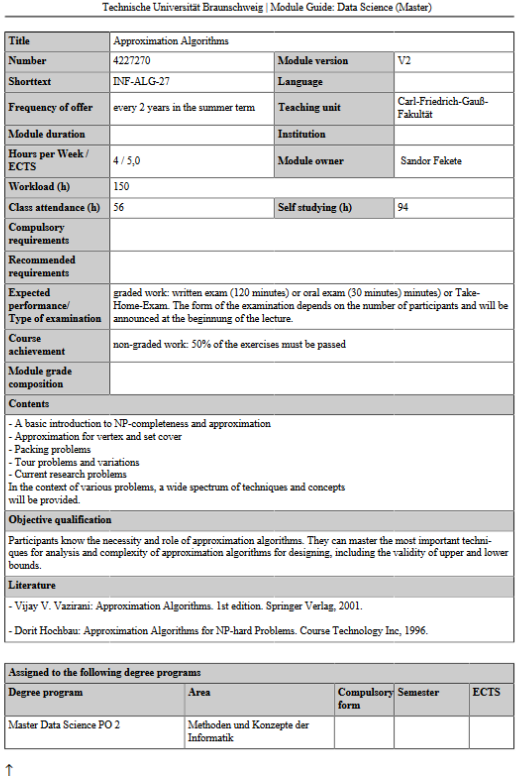


Modularization of the Degree Program

The course contents taught in the individual areas are combined into modules. A module consists of courses with related content.

Example "Approximation Algorithms": Excerpt from the module guide for the Examination Regulations

(see study program website "Documents“ Module Guide)



Technische Universität Braunschweig | Module Guide: Data Science (Master)

Title	Approximation Algorithms		
Number	4227270	**Module version**	V2
Shorttext	INF-ALG-27	**Language**	
Frequency of offer	every 2 years in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration		**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Sandor Fekete
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Recommended requirements			
Expected performance/ Type of examination	graded work: written exam (120 minutes) or oral exam (30 minutes) minutes) or Take-Home-Exam. The form of the examination depends on the number of participants and will be announced at the beginnung of the lecture.		
Course achievement	non-graded work: 50% of the exercises must be passed		
Module grade composition			

Contents

- A basic introduction to NP-completeness and approximation
- Approximation for vertex and set cover
- Packing problems
- Tour problems and variations
- Current research problems

In the context of various problems, a wide spectrum of techniques and concepts will be provided.

Objective qualification

Participants know the necessity and role of approximation algorithms. They can master the most important techniques for analysis and complexity of approximation algorithms for designing, including the validity of upper and lower bounds.

Literature

- Vijay V. Vazirani: Approximation Algorithms. 1st edition. Springer Verlag, 2001.
- Dorit Hochbau: Approximation Algorithms for NP-hard Problems. Course Technology Inc, 1996.

Assigned to the following degree programs

Degree program	Area	Compulsory form	Semester	ECTS
Master Data Science PO 2	Methoden und Konzepte der Informatik			

↑

Modules in Mathematics Core

Optimization

Discrete Optimization, Dynamic Optimization, Nonnegativity and Polynomial Optimization, Optimization in Machine Learning and Data Analysis 1, Algorithms and Complexity for Quantum Computing, …

Statistics

Statistical and Machine Learning, Time Series Analysis, Introduction into Statistical Learning Theory, …

Numerics

Model Order Reduction, Numerical Linear Algebra in Data Science, Numerical Methods and Learning from Data, …

Applied Analysis and Algebra

Inverse Problems, Computer Algebra, Machine Learning with Neural Networks, Introduction to Quantum Information Theory, Mathematical Foundations of Data Science, The Mathematics of Data Science, …

Modules in Computer Science Core

Algorithmics

Online Algorithms, Approximation Algorithms, Computational Geometry, Graphs Geometry and Algorithms, …

Machine Learning

Machine Learning for Data Science, Pattern Recognition, Deep Learning Lab, …

Databases and Information Systems

Data Warehousing and Data Mining, Information Retrieval und Web Search Engines, Knowledge-based Systems, …

Software Engineering

Software Product Lines, Python Lab, Constraint Solving, AI Engineering, …

Computer Graphics

Visualization Techniques, Image Aspects, …

Application Areas

Biology, Chemistry and Pharmacy

- Network Biology
- Immunometabolism
- Biophysical Chemistry
- Machine Learning in Computational Chemistry
- Elucidation and Modelling of Biological Structures
- Advanced Theoretical Chemistry
- Theoretical Spectroscopy, …

Medicine

- Biomedical Data Analysis
- Accident Informatics
- Health-Enabling Technologies
- Biomedical Image and Signal Analysis
- Medical Methodology
- Selected Topics of Representation and Analysis of Medical Data, …

Engineering

- Deep Learning in Remote Sensing
- Machine Learning
- Fundamentals of Turbulence Modeling
- Data-driven Material Modeling
- Introduction to Finite Element Methods, …

Image and Signal Processing

- Mathematical Image Processing
- Digital Signal Processing
- Computer Vision and Machine Learning
- Deep Learning for Imaging in Nano and Quantum Science
- Computer Lab Pattern Recognition, …

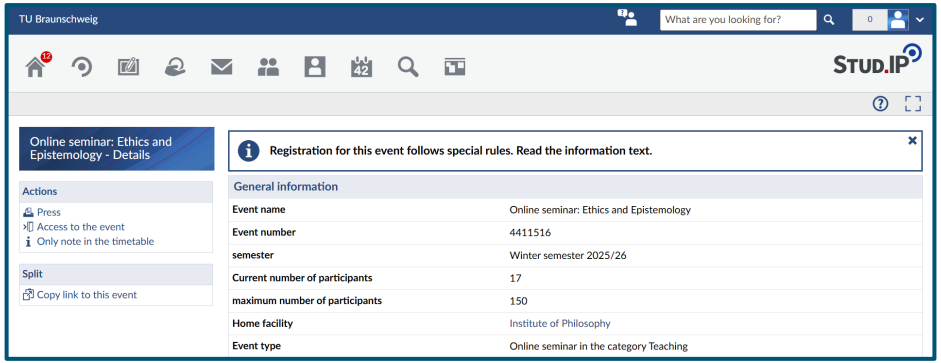
Area „Key Qualifications and Ethics“ (10-15 CP)

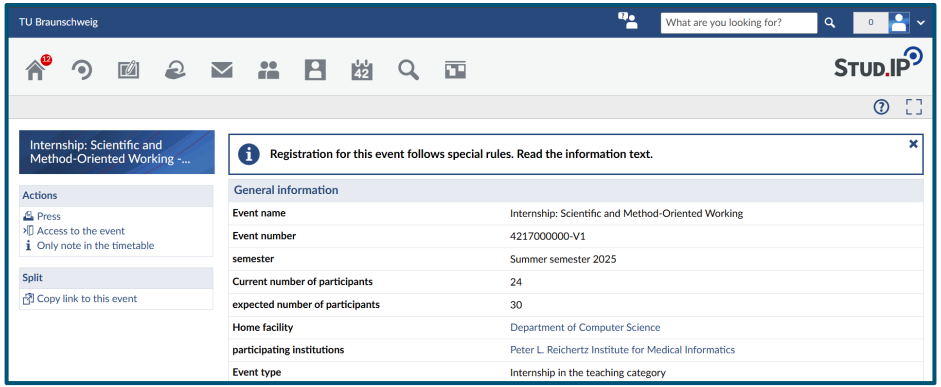
1st Compulsory Module 4411516 (5 CP)
“Ethics and Epistemology”
only available in winter semester
provide students with interdisciplinary qualifications

- *Future Data Scientists must be able to reflect on the ethical implications of their actions and must be able to recognize and interpret social and technical problems.*

2nd Compulsory Module 4217000000 (5 CP)
“Scientific and Method-Oriented Working” (SciMoo)
only available in summer semester

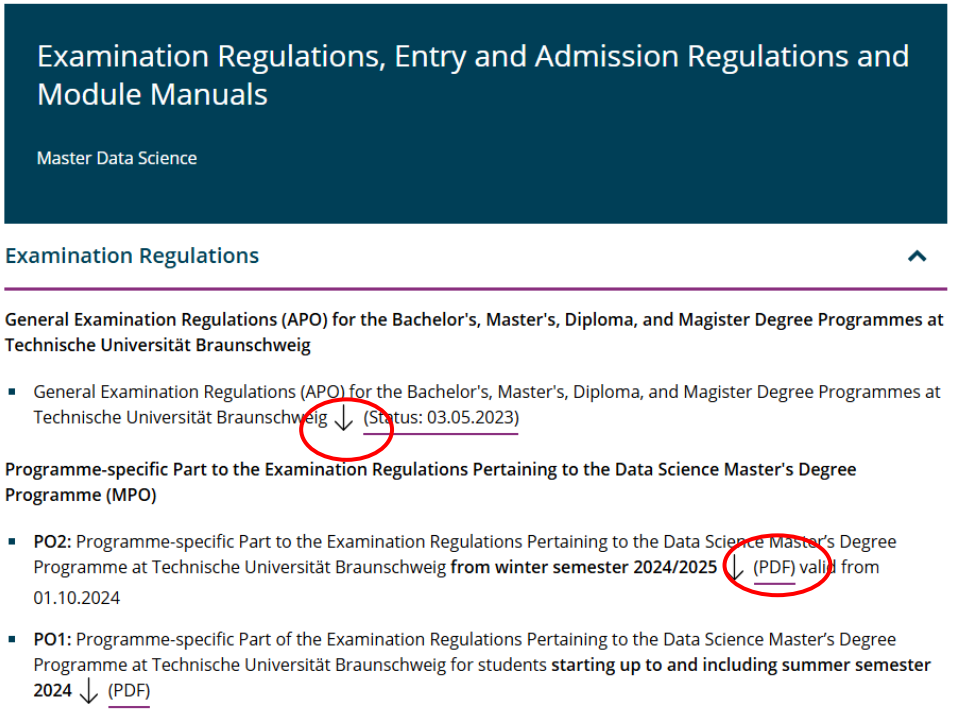
Additional credit points can be selected from the course catalogue or Language Centre (max. 5 CP)





The Examination Regulations: Your Rights and Obligations

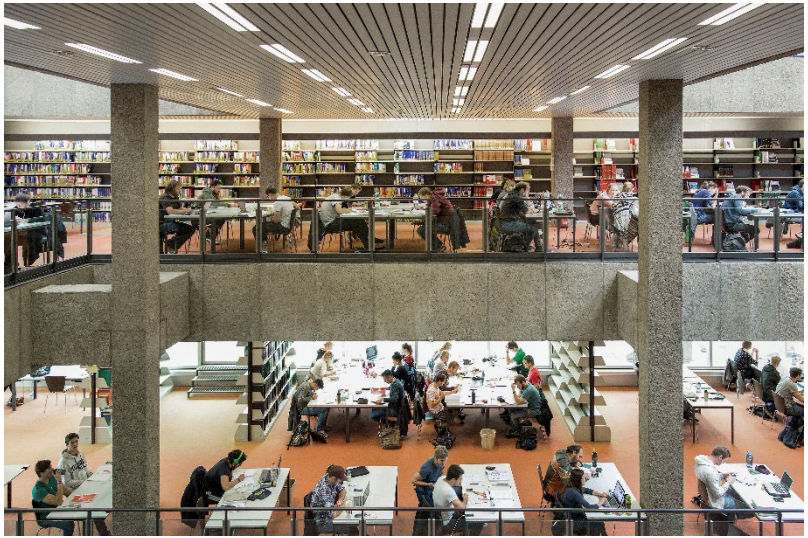
- The general and programme-specific examination regulations for the Data Science M.Sc. programme are available on the programme's homepage.
- Please read these rules carefully so that there won't be any "unpleasant surprises" later.
- Where can I find the Examination Regulations: Programme's homepage → Documents
- Examination Regulations



Duration of Study and Credit Points

Duration of study:

- Data Science M.Sc.: at least 4 semesters



Credit point system:

- 1 CP (Credit Point) = Workload 25-30 hours
- 30 CP should be achieved per semester

- **120 CPs are required for successful completion of your studies.**

Example Study Plan: Profile Medicine

Data Science - Profile 1 (MSc Data Science, Field of application: Medicine)

	1. Semester (WiSe)	2. Semester (SoSe)	3. Semester (WiSe)	4. Semester (SoSe)	
Computer Science	Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS	Elective Course Computer Science 5 ECTS	Seminar Computer Science 5 ECTS	Master Thesis 30 ECTS	55 ECTS
Mathematics	RampUp Mathematics 10 ECTS	Elective Course 1 Mathematics 10 ECTS	Elective Course 1 Mathematics 10 ECTS Practical Course Mathematics 5 ECTS		35 ETCS
Field of application	Medical-methodological specialisation module 1 5 ECTS	Accident Informatics 5 ECTS Medical-methodological Course 2 5 ECTS	Biomed. Image and Signal Analysis 5 ECTS		20 ETCS
Ethics and Mandatory Courses		Scientific and Method-oriented working 5 ECTS	Ethics and Epistemology 5 ECTS		10 ECTS
Total	30 ECTS	30 ECTS	30 ECTS	30 ECTS	120 ECTS

Compulsory modules Elective modules

Example Study Plan: Profile Biology, Chemistry & Pharmacy

Data Science - Profile 2 (MSc Data Science, Field of application: Biology, Chemistry, Pharmacy)

	1. Semester (WiSe)	2. Semester (SoSe)	3. Semester (WiSe)	4. Semester (SoSe)	
Computer Science	Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS	Elective Course Computer Science 5 ECTS	Seminar Computer Science 5 ECTS Elective Course Computer Science 5 ECTS		25 ECTS
Mathematics	RampUp Mathematics 10 ECTS	Elective Course 1 Mathematics 10 ECTS Elective Course 1 Mathematics 10 ECTS	Elective Course Mathematics 5 ECTS		35 ETCS
Field of application	Theoretical Biophysical Chemistry 5 ECTS		Project Work 15 ECTS	Master Thesis 30 ECTS	50 ETCS
Ethics and Mandatory Courses	Ethics and Epistemology 5 ECTS	Scientific and Method-oriented Working 5 ECTS			10 ECTS
Total	30 ECTS	30 ECTS	30 ECTS	30 ECTS	120 ECTS

Compulsory modules Elective modules

Example Study Plan: Profile Image and Signal Processing

Data Science - Profile 3 (MSc Data Science, Field of application: Image- and Signalanalysis)

	1. Semester (SoSe)	2. Semester (WiSe)	3. Semester (SoSe)	4. Semester (WiSe)	
Computer Science	RampUp Computer Science 10 ECTS	Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS	Practical Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS		25 ECTS
Mathematics	Elective Course 1 Mathematics 10 ECTS	Elective Course 1 Mathematics 10 ECTS Seminar Mathematics 5 ECTS			25 ETCS
Field of application	Computer Vision and Machine Learning 5 ECTS		Project Work 15 ECTS	Master Thesis 30 ECTS	50 ETCS
Ethics and Mandatory Courses	Scientific and Method-oriented Working 5 ECTS	Ethics and Epistemology 5 ECTS			10 ECTS
Total	30 ECTS	30 ECTS	30 ECTS	30 ECTS	120 ECTS

Compulsory modules Elective modules

Example Study Plan: Profile Data Science in Engineering

Data Science - Profile 4 (MSc Data Science, Field of application: Data Science in Engineering)

	1. Semester (SoSe)	2. Semester (WiSe)	3. Semester (SoSe)	4. Semester (WiSe)	
Computer Science	RampUp Computer Science 10 ECTS	Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS	Seminar Computer Science 5 ECTS Elective Course Computer Science 5 ECTS Elective Course Computer Science 5 ECTS		35 ECTS
Mathematics	Elective Course 1 Mathematics 10 ECTS Elective Course 1 Mathematics 10 ECTS	Practical Course Mathematics 5 ECTS		Master Thesis 30 ECTS	55 ETCS
Field of application		Machine Learning 5 ECTS Introduction to Finite Elements 5 ECTS	Deep Learning in Remote Sensing 5 ECTS Fundamentals of Turbulence Modeling 5 ECTS		20 ETCS
Ethics and Mandatory Courses		Ethics and Epistemology 5 ECTS	Scientific and Method-Oriented Working 5 ECTS		10 ECTS
Total	30 ECTS	30 ECTS	30 ECTS	30 ECTS	120 ECTS

Compulsory modules Elective modules

What do I have to consider at the beginning of my studies? 1/2

Mentoring and Study Planning

At the beginning of the programme, the Data Science Examination Board assigns each student a mentor from the department of Computer Science or the department of Mathematics.

- If you have **specific subject-oriented questions** about your studies, please get in touch with your mentor at the beginning of the semester
- Mentors often also offer **group appointments** where you can make contact with other mentees

What do I have to consider at the beginning of my studies? 2/2

Joint RampUp Phase in the first week of the semester

These events are compulsory. Please make sure you attend:

Monday	20.10.2025	15:00 – 16:30	PK 4.1	Machine Learning and AI in the Context of Data Science	*Prof. Michel Besserve*
Wednesday	22.10.2025	13:15 – 14:45	RR 58.3	Data Science Life Cycle	*Prof. Wolf-Tilo Balke & Prof. Tim Kacprowski*
Thursday	23.10.2025	15:00 – 16:30	PK 11.4	About Theory in Data Science	*Prof. Nicole Mücke*
Friday	24.10.2025	09:45 – 11:15	PK 4.1	German University System & Community Management	*Muhammad Usman*

Starting from the 2nd week of the semester, the Mathematics and Computer Science RampUp will take place separately.

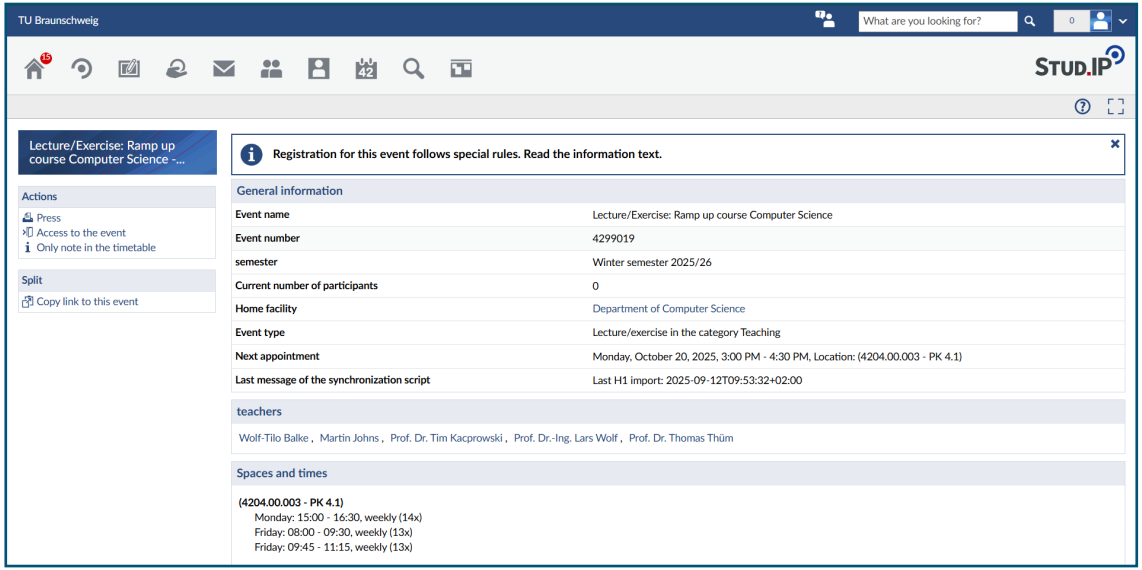
- *If you are unsure which Ramp Up module you need to complete, please contact the programme coordinator for more information.*

Further information about the two modules:

- **Computer Science RampUp**
- **Mathematics RampUp**

Stud.IP – The teaching and learning platform of TU Braunschweig

- Central tool for the digital support of all courses
- It provides information on the organisation of teaching and serve as a communication platform.
- Registration in courses
- Contacting the lecturers
- Information and access to the courses
- Access to the files of the courses
- Creating your own study groups



Stud.IP – Support

Our support team is your central address for all questions and problems concerning Stud.IP. We are at your disposal for questions concerning the daily use and support you in the use of tools and plugins as well as in the implementation of didactic concepts.

Support Times

Please refer to the following web link: https://www.tu-braunschweig.de/en/studip

Contact

✉ studip@tu-braunschweig.de

☎ +49 531 391-14040

Exam registration

Exam registration:

- online: https://connect.tu-braunschweig.de
- registration period in winter semester 2025/26: **15.12.2025 – 15.01.2026**
- exam registration via printed form: only for additional exams and other exceptions

Cancelling exam registrations:

- written exam: until penultimate working day before exam (Saturday and Sunday = no working day)
- oral exam: until one week before exam (please use deregistration form)
- homework (term paper): until 15.02. (winter semester), 15.08. (summer semester)
- portfolio exams: possible up to four weeks after the start of the lecture period

Seminar:

- registration: until day of kick-off event of the semester (the Data Science seminar module can only be taken from the 2nd semester onwards!)
- de-registration: until 2 weeks after beginning of lectures in that semester

Mailinglist Data Science

In your studies, it is essential to be able to receive the most important information quickly.

The central information channel for Data Science is **the mailing list.**

Please make sure that you are registered as a subscriber to the list with your TU email address and that you receive the messages at the beginning of the semester.
You should all have been added to the list by now.

- ***Mailinglist Data Science (ds-studs@lists.tu-braunschweig.de)***

Always stay up-to-date (Weblinks)

1. Programme-specific Part to the Examination Regulations Pertaining to the Data Science Master's Degree
2. Module Guide Winter Semester 2025/26
3. Timetable Winter Semester 2025/26
4. TU Connect
5. StudIP TU Braunschweig
6. Data Science First-Semester Students
7. Institutes

Contact - Programme Coordination and Study Guidance

- **Marvin Plagge**

Rebenring 58A (1st floor)

Room 124

Phone: +49-531-391-2831

Mail: ds-studium@tu-braunschweig.de

Office hours: By arrangement

Contact - Examination Office

- **Janine Werner**

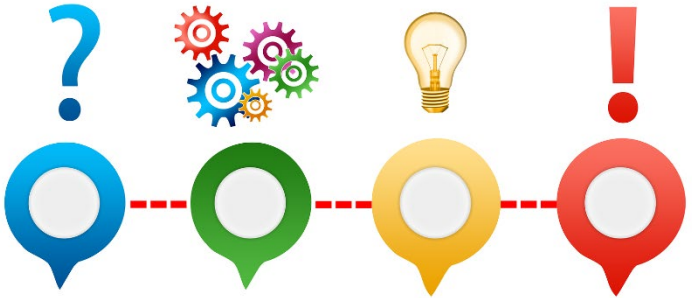
Rebenring 58A (1st floor)

Room 117

Phone: +49-531-391-2851

Mail: pa-mathe@tu-braunschweig.de

Office hours: By arrangement



Expectations