



# Welcome to Paderborn

Introduction to the Master Program in Computer Science

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**Address Main Campus** Building E, room E1.125 and E1.129      Mondays to Thursdays 10:00 – 11:30  
12:30 – 15:00

**Address Campus Fürstenallee** Building F, room F2.119      Thursdays 10:00 – 11:00

YouTube: <https://www.youtube.com/user/FakultaetEIM>



## Semester start

- Lectures start on 7 October.
- Courses will be „in real life“, not online.
- Make sure to be there for the first lecture – all important information will be given there
  - If you can't be there, check PANDA for information or contact the lecturer.
- Information from our student's council: <https://fsmi.uni-paderborn.de>



## Getting into the right mindset

- Check your knowledge with our self-assessment.
  - If you experience difficulties in a certain area, try to find a good book to improve your knowledge.
- Get acquainted with the standards of good scientific practice.
  - In particular, make sure you are aware of the problem of plagiarism.
- Be aware of the fact that you will have to organize yourself.
  - From planning your master studies to visiting lectures and tutorials to finding a master's thesis.
- Don't be afraid to talk to us!
  - When something is not clear or there is a problem, talk to your lecturer, us, the examination office – whoever might be able to help. And don't wait too long!



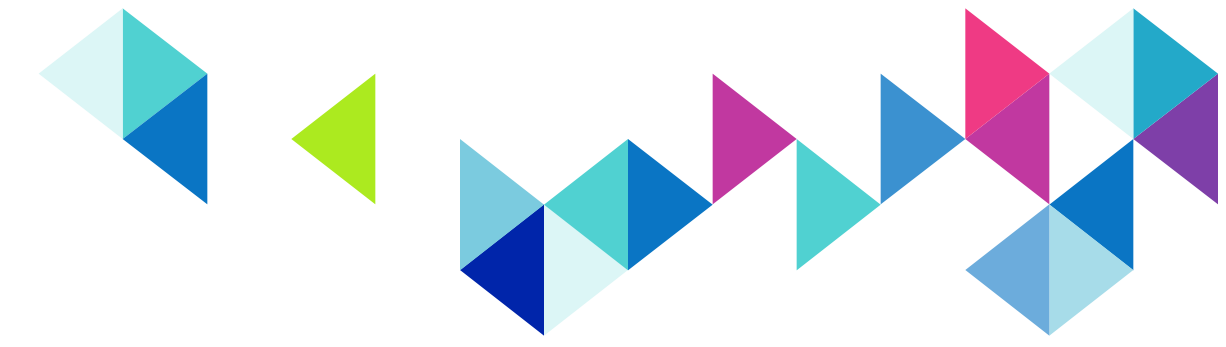
## What every lecturer will expect from you

### Ability to apply foundations of Computer Science

- usage of formal methods to specify problems, structures, systems, languages, ...
- formal methods to analyze algorithms
- formal methods to check solutions
- proving properties of algorithms (correctness, performance, ...)

### Experience in doing practical work

- application of methods and tools for software design and implementation
- solid background in object-oriented concepts
- substantial experience in at least one programming language
- ability to switch to a new programming language within a short time



## There's more to it!

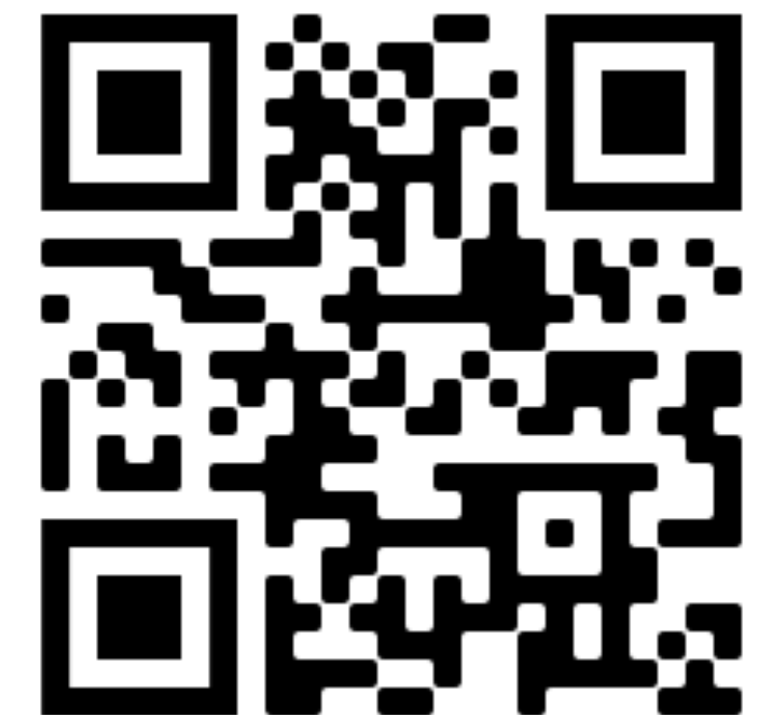
Ability to do scientific work

- searching for and investigating scientific publications
- writing scientific documents
- adequate structure, clear descriptions and explanations, citations and references, correct English
- developing and giving presentations
- avoid plagiarism



## Planning for your first semester

- Check the course catalog for the upcoming semester at <https://paul.uni-paderborn.de>
  - "Faculty of Computer Science, Electrical Engineering and Mathematics" – "Computer Science" – "Studiengang Informatik (ab WiSe 24/25)" – "Master-Studiengang Computer Science"
- Browse through the courses from the first five entries, the focus areas, to identify courses you might wish to take.
  - Check if there is a self-assessment for the course for prior knowledge.
- You can't take a seminar or a project group in your first semester here.







## Planning for your first semester

- The recommended workload for each semester is 30 credits, i. e. 5 courses in the first semester of 6 credits each.
- Self-assessment tests are available for many courses: <https://cs.uni-paderborn.de/en/studies/getting-started/information-for-international-students/self-assessment-tests-for-master-lectures>
- Keep in mind that this workload may be too high:
  - Language courses (optional)
  - Getting used to living in Germany
  - Getting used to the German university system
- You need to register for the modules as well as the courses – until 25 October.







# Program structure

## Five Focus Areas

- Classical and Quantum Algorithm Design
- Computer and Communication Systems
- Data Science and Intelligent Systems
- Security
- Software Engineering

You can choose one of these areas as specialization area when applying for a master's thesis.

- No need to decide now, but it's good to have an idea.
- If you wish to specialize, plan ahead and ideally try to you have three modules in the focus area you wish to write your Master's thesis in after three semesters.
- Specialization is optional.





# Modules

Every student has to

- study nine modules from any focus areas

If you wish to specialize, three of these modules and the master thesis must be from the same focus area.

Most modules are offered once per year.

Every module has 6 ECTS points and

- belongs to one or more focus areas (of the five).
- consists of exactly one class (from that focus area).
- is described in the module handbook (Modulhandbuch).

If a module belongs to more than one focus area, you can move it later to meet the specialization area requirement.







# Module Handbook

Contains detailed descriptions of all courses

- Content of the course
- Type of exam
- Course achievement (if any)
- Language of instruction (virtually all are in English)
- When to expect: winter or summer semester
- Also contains lists which module is in which focus areas.
- Updated each semester, see <https://cs.uni-paderborn.de/en/studies/audit-matters>





# Master degree program in Paderborn (example)

1	Module I (6 credits)	Module II (6 credits)	Module III (6 credits)	Module IV (6 credits)	Module V (6 credits)
2	Project Group (20 credits)	Module VI (6 credits)	Module VII (6 credits)	Key Skills (6 credits)	General Studies (10 credits)
3		Module VIII (6 credits)	Module IX (6 credits)		
4	Master's Thesis (30 credits)				







## Recommendations for the first semester

- Pick five modules that you believe to be the most interesting for you.
- If you already have an idea which focus area you might wish to specialize in, pick at least two in that area.
- If you don't have an idea which focus area you might wish to specialize in, don't worry! Just pick modules according to your interests.
- Check whether there is a self-assessment for the module and take it.
- Register for the module as well as the course.
- Also register for the course achievement and the exam during the registration phase.
- If you struggle with a course or your total workload proves to be too high, concentrate on those modules that you are confident to pass.
- Deregister from the course achievement and the exam in those courses that you wish to drop.
- Keep track of all important deadlines and enter them into your electronic calendar with a reminder!



# Modules in Classical and Quantum Algorithm Design

- **Advanced Algorithms**
  - Advanced Complexity Theory
  - Advanced Distributed Algorithms and Data Structures
  - Algorithms for Complex Virtual Scenes
  - Foundations of Cryptography
- **Introduction to Quantum Computation**
- **Post-Quantum Cryptography**
  - Quantum Algorithms
  - Quantum Complexity Theory
  - Quantum Information







# Modules in Computer and Communication Systems

- **Advanced Computer Architecture**
- Advanced Distributed Algorithms and Data Structures
- Advanced Networked Systems
- **Reconfigurable Computing**
- **VLSI Testing**





# Modules in Data Science and Intelligent Systems

- **Advanced Algorithms**

- Advanced Distributed Algorithms and Data Structures
- Data Science for Software Engineering
- Data Science in Industrial Applications
- Explainable Artificial Intelligence

- **Foundations of Knowledge Graphs**

- Introduction to Description Logics
- Machine Learning for Biometrics
- Multi-Objective Optimisation

- **Unsupervised Learning and Evolutionary Optimisation Using R**







## Modules in Security

- Advanced Distributed Algorithms and Data Structures
- **Designing code analyses for large-scale software systems 1**
- Designing code analyses for large-scale software systems 2
- Foundations of Cryptography
- **Human Factors in Security and Privacy**
- **Introduction to Quantum Computation**
- Machine Learning for Biometrics
- **Post-Quantum Cryptography**
- **Privacy and Technology**
- Quantum Complexity Theory
- **Real World Crypto Engineering**
- Usable Security and Privacy
- Web Security





# Modules in Software Engineering

- Concepts of Computer Science
  - **Data-Driven Engineering**
  - Data-Driven Innovation
  - Data Science for Software Engineering
  - Data Science in Industrial Applications
- **Designing code analyses for large-scale software systems 1**
  - Designing code analyses for large-scale software systems 2
  - **Human Factors in Security and Privacy**
  - Model-Based Systems Engineering
  - **Software Architecture Design and Recovery**







## Seminars are special

- Counts for 6 ECTS points
- 2 meeting hours per week or compact on two to three days
- Includes a lecture on how to work and write scientifically
- Lecturer proposes topics (Seminarthemen)
- Every student selects or is assigned one topic to work on and then
  - prepares a talk with slides (Seminarvortrag)
  - submits a seminar paper (Ausarbeitung)
- You need to work scientifically and be aware of good practices and the problem of plagiarizing in particular!
- Seminars do not belong to specific focus areas. You are free to choose.
- See <https://cs.uni-paderborn.de/en/studies/seminars-of-computer-science> for information on how to apply for a seminar.





## Project Groups are even more special

- Workload: 20 ECTS points in one year – including semester breaks
- Presentation of all project groups in a public event (Projektgruppenvorstellung) in the first week after teaching season – you should participate to find a group that suits you.
- Interested students apply for a project group and 8 to 16 students are accepted.
- Ranking by you as well as by the lecturers.
- Working for two semesters on a project
  - often: concept and implementation of some software







## Project Groups are even more special

- Highly self-organized
  - You have to contribute actively!
  - You will be evaluated continuously.
  - Usually requires at least two days per week being present in Paderborn.
- 
- All our project groups are in English!
  - Project groups do not belong to specific focus areas. You can apply to any one.
- 
- All details at <https://cs.uni-paderborn.de/en/studies/project-groups/>





# Master's Thesis (Masterarbeit)

Workload: Full-time for one semester (30 ECTS)

All of this: within 6 months (formally checked!)

What has to be done?

- Literature review
  - Research: develop new results!
  - Obey rules of good scientific practice!
  - Often: implementation of some software
  - Writing a thesis (~ 80-120 pages) on scientific level
- First a planning phase (typically 1 month)
  - Then the real work (5 months)





## Master's Thesis (Masterarbeit)

### Finding an advisor (Betreuer)

- talk to professors working in an area that interests you
- talk to the organizer of your project group
- ask friends

Finding a topic (Thema) is an interactive process between student and advisor

- own ideas?
- project group topic?
- discussion with the (potential) advisor!

The Master's thesis defines your area of specialization if you wish to specialize.  
In this case, you need to have three modules completed before registering the thesis.







## German Language Course (Deutschkurs)

- Language courses are optional!
- Language Courses hosted by the International Office
- You can cover the complete „General Studies“ part with language courses (12 ECTS)
- Check <https://www.uni-paderborn.de/en/zfs/language-courses-for-students/german>





## What you need to do to get your degree

Every student has to...

- ... take nine modules from any focus areas
- ... take the course Scientific Work in the module Key Skills
- ... take one seminar module
- ... take part in a project group
- ... write a Master's thesis (may be from your specialization area)
- ... do general studies or take the German language courses

54 credits

1 credit

5 credits

20 credits

30 credits

10 credits

Adding up to: 120 credits

It is your own responsibility to meet these criteria!





## Examinations: Normal modules

Oral or written exam about the class

- Oral exams: individual appointment with the lecturer
- Written exams: usually two dates offered in the semester breaks

Class may include written homework or project work as pre-requisite („course achievement“ or „Studienleistung“).

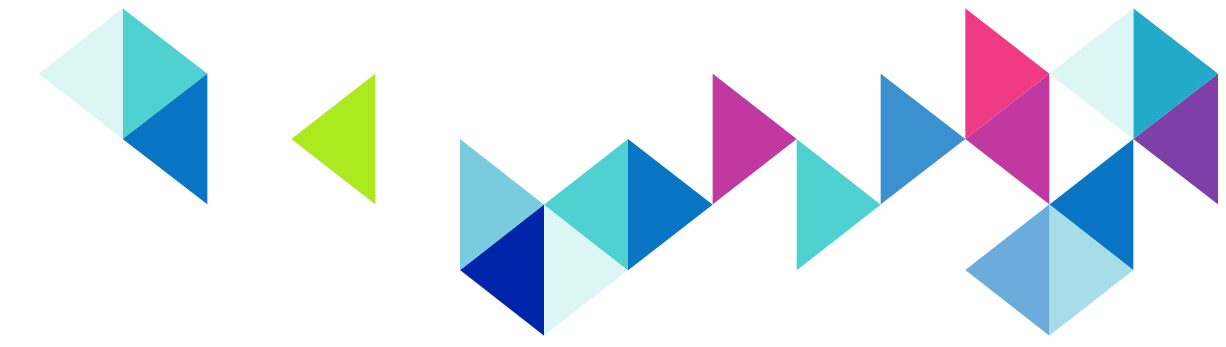
You need to register for the exams!

- All with PAUL
- Registration for first exam period:  
21 October to 21 November
- Registration for second exam period:  
24 February to 7 March (no late registrations!)

De-register if you don't want to take an exam!  
Otherwise you might be stuck with that module.







## Examinations: Other types

**Seminar:** Evaluation of presentation and seminar paper

**Project group:** Permanent evaluation throughout the project

**Master's Thesis:** Evaluation by the advisor and a co-advisor





## Examinations: Repetition

**Module** exams can be repeated twice.

**Seminars** can be repeated twice.

**Project group** can be repeated twice (you really don't want that!).

**Master's Thesis** can be repeated once.





## Additional Modules

There are (limited) ways

- to shift aside („compensate“) exam failures
  - e.g. failure in one module
  - give up on that one and try another one instead
- to improve exam results
  - e.g. you succeeded in a module exam but with an unsatisfactory result, you can try a different module additionally.
  - You can't retake a module that you have passed.







## Final failure is possible! If ...

- ... you have no more options to use compensation or deregistration **and** you are no longer able to complete nine modules
- **or** three attempts for a project group failed
- **or** three attempts for a seminar failed
- **or** two attempts for a Master's thesis failed





## Common pitfalls

- Deadlines are important. Some things can be amended if you miss a deadline, some can't or may result in delays of up to a year!
- You need to register for all sorts of things. Do it – and mind the deadlines!
- If you don't want to complete a course, de-register it and everything associated with it – and mind the deadlines. Otherwise you may be blocked from taking other courses as there is an upper limit of courses you can take.
- Pay your semester fees as early as possible. Otherwise you might not be able to participate in the seminar or project group distribution – which will result in a delay of one semester at least.
- Never miss the first meeting of a course.
- Always – ALWAYS! – visit the first lecture in a semester where all necessary information about the course will be given!





## Important deadlines in this semester

### Until 25 October

Registration for modules and courses

### Between 21 October and 21 November

Registration for course achievement

Registration for qualified participation (if applicable)

Registration for exams

### Until 17 January

De-registration from course achievement

De-registration from qualified participation

### Two days before exam

De-registration from exam

### Between 24 February and 7 March

Registration for 2nd exam phase, also late registration for course achievement

If you missed this registration phase, you will most likely have to wait for almost one year to take your exam in that course!

**Add those dates to your favourite calendar tool with a reminder!**







## Final remarks

- PAUL is your friend
  - Most important information is sent via the PAUL system or is shown there when you log in.
  - Check your university email address regularly!
  - Introduction to the PAUL system: tomorrow afternoon!
  - Check out the PAUL introduction playlist at YouTube.
- Many courses use the PANDA system for information and course material.
- Watch out for the project group presentation at the end of the semester and attend it!
- Join in on our monthly live stream on the Faculty's YouTube channel at <https://www.youtube.com/user/FakultaetEIM>
  - usually third Thursday each month (except March and September) at 6 pm local time
  - Q&A for the Master program

