Information on the Master Program in Computer Science according to FPO 2021

Department of Electrical Engineering and Computer Science

as at October 22, 2026

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1 Introduction

This document provides you with assistance for successful Master studies in Computer Science at the University of Siegen. In particular, it presents the structure and elective courses of the program in detail.

The Master's program in Computer Science is roughly divided into a compulsory, a core and a specialization area:

- The compulsory area (60 CP) includes an overview of current research topics in the Department ETI (Electrical Engineering and Computer Science), instruction in scientific work, project work, and master thesis.
- In the core area (24 CP), four modules must be chosen in which key areas of computer science are treated in depth.
- The specialization area (36 LP) allows the acquisition of deeper or more advanced knowledge in one of the following fields, depending on the chosen specialization:
  - Embedded Systems: technical (hardware-related) computer science, embedded systems.
  - Visual Computing: computer graphics, image processing, visualization, pattern recognition, machine learning, computer vision.
  - Complex and Intelligent Software Systems: software engineering, intelligent systems, pattern recognition.
  - Medical Informatics: medical fundamentals, informatics applications in medicine.

  The first three of these specialization areas can be studied entirely in English.

The program is designed to be studied full-time within four semesters or part-time within eight semesters, with the fourth semester (or the seventh and eighth semester in the part-time program) devoted to the master thesis.[1]

The modules to be studied consist of one or more courses (e.g. laboratory or lecture and exercise hours) and are completed with one or more achievements (study achievements and/or examinations). The courses you want to attend in a semester and the study achievements and examinations you want to take in that semester must each be registered via the campus management system, called *unisono*, within a specified period of time, see section 7.

The time required for a module is expressed in credit points (CP). One CP corresponds to a workload of approx. 25-30 hours, which includes participation in the courses, preparation and follow-up work, preparation for examinations, and the completion of study achievements and examinations. As a rule, modules amounting to 30 CP should be studied per semester. The entire study program thus has 120 CP.

As an aid for planning your studies, the following sections of this document summarize, for each individual specialization, which modules are mandatory to study and which can be selected additionally. In order to simplify your time planning, it is indicated for each module in which semester it is offered, in which semester it is recommended to take it and whether other modules are a prerequisite in terms of content. In addition, you will also find exemplary study plans.

Section 7 additionally compiles important information on the organizational process of your studies.

Note that because only the specializations 'Embedded Systems' and 'Visual Computing' can be studied in English, this version of the document only discusses these two specializations. For a complete discussion of all specializations, please turn to the German version of this guide.

Please also note that no guarantee can be given for the correctness of the information in this document and that the document may also takes into account changes to the examination regulations that are already planned but not yet officially adopted. **Legally binding is exclusively the information in the examination regulations**, which you can find on the websites of the Examination Office for Computer Science, among others. If you notice any errors in this document, please report them to `roland.wismueller@uni-siegen.de`.

[1] The semester numbers in this brochure refer to the full-time program. In the part-time program, the semester numbers should be doubled.

Explanation of Module Tables

Tables of modules to be studied or selected are frequently presented below. They always have the following structure:

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
...	...	...	...	...	...	...
4INFMA000	Example Module	6	W	1	2	
...	...	...	...	...	...	...

The first column indicates the university-wide unique module number for the module. This number is used e.g. in the campus management system to identify the module as well as the associated study achievements and examinations.[2] The stored hyperlink leads you directly to the module description in the campus management system unisono (please select the tab 'Contents' there; however the descriptions are mainly in German).

The column 'Sem.' indicates in which semester the module is offered (S = summer semester, W = winter semester, E = every semester, I = irregular).

The columns 'S.Wi.' and 'S.Su.' indicate the semester(s) in which the module is recommended to be taken. The column 'S.Wi.' applies to a study start in the winter semester, the column 'S.Su.' to a study start in the summer semester.

In the last column, the numbers of the modules are listed, which are a content-related prerequisite for the named module, i.e. which should be studied beforehand. Modules in small print indicate prior knowledge that you should already have from your Bachelor's degree. The hyperlink again leads to the module description.

Please note that modules that can be chosen according to the examination regulations but are not (or no longer) offered in the foreseeable future are not listed in the tables.

[2] Courses, however, have their own numbering system from which the module affiliation is not apparent.

2 Compulsory and Core Modules

2.1 Compulsory Modules

There are a total of four compulsory modules in the Master's program in Computer Science:

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA001_1	Scientific Working (Lecture)	3	W[1]	1	2	
4INFMA002	Cutting Edge Research	6	W	1	2	
4INFMA001_2	Scientific Working (Seminar)	6	E[2]	2,3	3	4INFMA001_1
4INFMA003	Project Work	15	E	2+3	2+3	
4INFMA004	Master Thesis	30	E	4	4	

- The module 'Cutting Edge Research' is a lecture series in which all computer science chairs of the department present their research foci. This module serves as orientation for the choice of topics for the seminar (within the module 'Scientific Working'), the project work, as well as the master thesis.
- In the module 'Scientific Working', the basics of scientific working and good scientific practice are first taught in a block course at the end of the winter semester.

  The second part of the module consists of a seminar which should be attended in the next semester (or the semester after). In this seminar, participants are required to autonomously prepare and deliver a presentation and a seminar paper on a given topic. Seminars are offered independently and simultaneously by the different chairs. Please note that the study achievement of the block course is a **prerequisite** for admission to the seminar!

  You can find the individual offers in the campus management system unisono (see section 7.1) if you open the module 'Scientific Working' in the compulsory section. You will then see which chairs offer a seminar in the respective semester. In general, there is a (mandatory) preliminary meeting for the seminar in one of the first lecturing weeks, in which the individual topics are presented and assigned. The seminar presentations generally take place in a block event towards the end of the lecture period.
- Within the scope of the 'Project Work' you will work in a team on a more complex, practical task from a research project of the organizer over a period of two semesters (typically in the second and third semester). In addition to purely technical skills, teamwork and independent project management also play an important role in the project work.

  Just like the seminar, the project work is also offered independently by the individual chairs. Here, too, you can find the offers by opening the module in the unisono system. Ideally, you should get together in advance to form a group of students with about 3-6 participants who have similar interests, since the project work is usually carried out by a group of students. In exceptional cases, individual students may also carry out a project work, provided that they are closely involved in a group of researchers.

  If you do not find a suitable offer in a semester, please do not hesitate to ask the lecturers directly (see website)!
- The master thesis usually takes up the last semester of study. Here you have to show that you are capable of independently solving a given task with a scientific claim and presenting your solution in written and oral form.

  Please note that you can **not** find offers for master theses via unisono. Please inform yourself about topic offers directly on the websites of the lecturers (see website) or also by contacting the lecturers. Further information, in particular concerning the registration, can be found in the section 7.5.

[1] Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!
[2] Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!

2.2 Core Modules

To deepen the basic knowledge in the field of computer science, there is a catalog of core modules in the Master's program, from which four modules must be chosen:

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA020	Software Engineering II	6	S	2	1,3	4INFBA007
4INFMA021	Modeling and Animation	6	W	1,3	2	4INFBA020 4INFBA200
4INFBA022/2	Introduction to Embedded Systems	6	S	2	1,3	4INFBA009
4INFMA023	Computer Architecture II	6	W	1,3	2	4INFBA010
4INFMA024	Parallel Processing	6	W	1,3	2	4INFBA003 4INFBA004 4INFBA010 4INFBA011
4INFMA025	Computer Networks II (in German)	6	S	2	1,3	4INFBA012
4INFMA026	Advanced Logic	6	S	2	1,3	4INFBA005 4INFBA006
4INFMA028	Algorithmics I	6	W	1,3	2	4INFBA003 4MATHBAEX11
4INFMA029	Database Systems II	6	S	2	1,3	4INFBA008

The choice of modules is free, with two exceptions:

- In the specialization 'Visual Computing' the module 4INFMA021 'Modeling and Animation' must be chosen as one of the core modules.
- In the specialization 'Complex and Intelligent Software Systems' the modules 4INFMA020 'Software Engineering II' and 4INFMA029 'Database Systems II' must be chosen as core modules, if you started your studies in winter semester 2024/25 or later.

As an aid to decision-making, the sections 3 and 4 indicate which core modules are particularly recommended for the respective specializations.

If you would like to study extra modules from the above catalog in addition to the four core modules that must be chosen, you may study a maximum of two or three more modules (depending on your area of specialization) as part of the specialization. More about this in the sections 3 and 4.

3 Specialization Embedded Systems

3.1 Introduction: What are Embedded Systems?

Embedded systems are computers that are integrated into a technical context. They can be found in countless application areas and are ubiquitous today. Examples are the transportation sector (e.g. automobile, airplane, railroad), the medical sector, the energy sector, industrial automation and home automation. In addition, embedded systems are also a component of consumer electronics and household appliances.

Embedded systems have led to breakthrough advances in functionality, safety, energy efficiency, environmental protection, and convenience. Today's premium vehicles, for example, contain up to 100 controllers and 90% of innovations in the automotive industry are based on electronics and embedded systems. Embedded systems range from simple devices with a single microcontroller to complex distributed systems that can be networked both locally and over large geographical distances.

Embedded systems often have high requirements for real-time capability, reliability, security and functional safety. Even if individual components fail, the correct services of the overall system must continue to be provided. In general, the overall system must therefore be more reliable than its underlying components. This can be achieved by suitable fault tolerance mechanisms. In an aircraft with 'fly-by-wire' technology, for example, the correct functioning of the embedded system is essential for control and safety. In contrast to conventional control systems, the actuators (electric motors, hydraulics) are controlled exclusively by electrical signals from the embedded systems. Similarly, the embedded system in an autonomous vehicle, which is responsible for sensing the environmental conditions and controlling the vehicle, must function correctly in all situations to prevent hazards to the occupants and the environment.

3.2 Job Profiles in the Field of Embedded Systems

The field of embedded systems deals with the architecture, design, validation, implementation, operation and maintenance of computers, networks, sensors and actuators in monitoring, steering or control functions. Embedded systems represent an interdisciplinary field in which engineering issues, especially from electrical engineering and information technology, interact with computer science. This knowledge is needed almost everywhere in research and development in industry and at universities, so graduates in the field of embedded systems face excellent career prospects.[1]

[1] Reference: Informationstechnische Gesellschaft im VDE, Gesellschaft für Informatik - GI/ITG-Empfehlungen. Curriculum für Bachelor- und Masterstudiengänge Technische Informatik. Fachbereich Technische Informatik. 2018. In German.

3.3 Structure of the Study Program with Specialization in Embedded Systems

The study program with the specialization Embedded Systems includes compulsory modules on scientific working, modules with insights into current research projects at the University of Siegen, a project work, and a master thesis. Topics from different areas of embedded systems can be chosen (e.g. Networked Embedded Systems, Ubiquitous Computing, Embedded Software, Hardware Architectures, Embedded AI).

The core modules serve to deepen the computer science-oriented competences from the bachelor's degree, whereby modules on Embedded Systems, Computer Architectures and Computer Networks are particularly recommended.

The specialization modules are used for specialization based on the respective interests. The module catalog Embedded Systems offers modules on application areas, development methods, reliability, hardware, and software for embedded systems.

In addition, up to two specialization modules from other specializations can be selected.

3.3.1 Compulsory Modules (60 CP)

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA001_1	Scientific Working (Lecture)	3	W[2]	1	2	
4INFMA002	Cutting Edge Research	6	W	1	2	
4INFMA001_2	Scientific Working (Seminar)	6	E[3]	2,3	3	4INFMA001_1
4INFMA003	Project Work	15	E	2+3	2+3	
4INFMA004	Master Thesis	30	E	4	4	

3.3.2 Core Modules (24 CP)

A total of four modules must be selected from the following catalog. For the specialization 'Embedded Systems', the modules marked with an asterisk (*) are particularly recommended.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFBA022/2	Introduction to Embedded Systems*	6	S	2	1,3	4INFBA009
4INFMA023	Computer Architecture II*	6	W	1,3	2	4INFBA010
4INFMA025	Computer Networks II (in German)*	6	S	2	1,3	4INFBA012
4INFMA020	Software Engineering II	6	S	2	1,3	4INFBA007
4INFMA021	Modeling and Animation	6	W	1,3	2	4INFBA020 4INFBA200
4INFMA024	Parallel Processing	6	W	1,3	2	4INFBA003 4INFBA004 4INFBA010 4INFBA011
4INFMA026	Advanced Logic	6	S	2	1,3	4INFBA005 4INFBA006
4INFMA028	Algorithmics I	6	W	1,3	2	4INFBA003 4MATHBAEX11
4INFMA029	Database Systems II	6	S	2	1,3	4INFBA008

[2]Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!
[3]Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!

3.3.3 Specialization Modules (36 CP)

In the optional specialization modules, technological components (e.g. FPGAs, memory technologies) for the implementation of embedded systems are studied in depth. In addition, modules with techniques and methods relevant for the design are offered (e.g. Digital IC Design, Reliability of Technical Systems). Since many embedded systems are realized as distributed systems, modules on industrial communication and communication security are also available. Further modules provide the bridge to application areas, e.g. industrial and ubiquitous systems.

Modules of at least 24 CP must be selected from the catalog 'Embedded Systems' (see following table), for the remaining modules a free selection from all specialization catalogs as well as from the catalog 'Core Modules' is possible. In the sense of a clear focus, however, it is recommended to also select these modules from the Embedded Systems area.

Modules in the Catalog Embedded Systems (24-36 CP)

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA100	Development of Embedded Systems using FPGAs	6	W	1,3	2	4INFBA009 4INFBA010
4INFMA101	Lab Ubiquitous Systems	6	E	1-3	1-3	4INFBA003
4INFMA102	Storage Technologies	6	S	2	1,3	4INFBA009 4INFBA010
4ETBA004	Grundlagen der Signal- und Systemtheorie (in German)	6	S[4]	2	1,3	
4ETMA159	Assembly and Interconnection Technology (in German)	6	S	2	1,3	
4ETMA160	Reliability of Technical Systems	6	S	2	1,3	
4ETMA167/2	Data Science for Dynamic Systems	6	W[5]	1,3	2	
4ETMA200/2	Advanced Signals and Systems I	6	W	1,3	2	
4ETMA201/2	Advanced Signals and Systems II	6	S	2	1,3	4ETMA200/2
4ETMA263	Selected Topics in Wireless Technologies	6	S	2	3	
4ETMA303	Digital IC Design	6	S	2	1,3	4INFBA009
4ETMA355/2	Microsystem Fabrication & Test	6	W[6]	1,3	2	
4DBHSBA10	Telematics - Technologies and Applications	6	S	2	1,3	
4DMTBA19	Telematics - Multimedia	6	W[7]	1,3	2	
4MBMA052	Condition Monitoring	6	W	1,3	2	

Freely Selectable Modules (0-12 CP)

In case of special interest, a maximum of two modules (totaling a maximum of 12 CP) may be chosen from other specializations or from the catalog of core modules.[8]

In the following table all selectable modules of the other specializations are listed. It is recommended to choose the modules marked with an asterisk (*) which are clearly related to Embedded Systems. In principle, the other modules can also be selected; however, it is explicitly not recommended to select the modules printed in gray.

[4] Planned starting in winter term 26/27.
[5] Starting winter term 2026/27, this module does no longer include a study achievement.
[6] Starting winter term 2026/27, this module includes a study achievement!
[7] This module will presumably be offered only until winter term 27/28.
[8] see section 3.3.2. Of course, only modules that have not already been chosen as core modules may be selected.

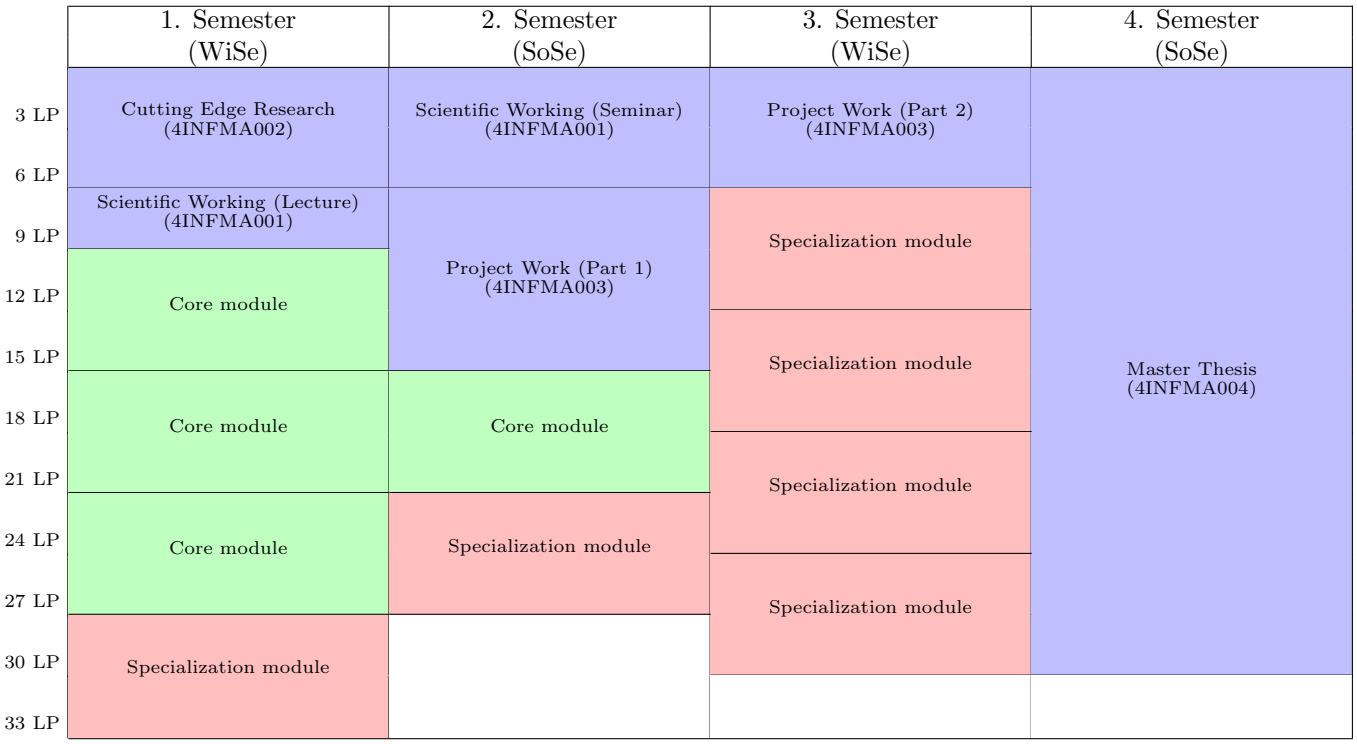
No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA204	Deep Learning*	6	W	1,3	2	4INFBA013 4MATHBAEX01
4INFMA300	Algorithmics II*	6	S	2	1,3	4INFMA028
4INFMA301	Model Checking*	6	W	1,3	2	4INFBA005 4INFBA006 4MATHBAEX11
4INFMA305	Ubiquitous Computing*	6	E	1-3	1-3	
4INFMA307	Advanced Programming in C++*	6	S	2	1,3	4INFBA003
4INFMA308	Theoretical Computer Science*	6	W	1,3	2	4INFBA005 4INFBA006
4INFMA202	Scientific Visualization	6	W	1,3	2	4INFBA020
4INFMA203	Statistical Learning Theory	6	S	2	1,3	4INFBA013
4INFMA205	Recent Advances in Machine Learning	6	S	2	1,3	4INFBA013
4INFMA212	Unsupervised Learning	6	W	1,3	1,3	4INFBA004 4MATHBAEX01
4INFMA213	Visual Analytics	6	S	2	1,3	4INFBA013
4INFMA215	Automated Machine Learning	6	S	2	1,3	4INFMA204
4INFBA302	Complexity Theory I	6	W	1,3	2	4INFBA006
4INFMA304	Complexity Theory II	6	I	1-3	1-3	4INFBA302
4INFMA312	Recommender Systems (in German)	6	W	1,3	2	4INFBA004 4INFBA013
4INFMA313	Quantum Complexity Theory	6	S	2	1,3	4INFBA302
4INFMA401	Knowledge Management	6	W[9]	1,3	2	
4INFBA502	Deep Learning Lab	6	W[10]	1,3	2	4INFBA004 4INFBA013
4ETMA168	Reinforcement Learning	6	S	2	1,3	
4ETMA250	Computational Imaging	6	W	1,3	2	
4ETMA257	Introduction to Compressive Sensing	6	W	3		
4DBHSBA15	Data Science in Medicine (in German)	6	W	1,3	2	
4DMTBA04	Medical Technology	6	S	2	1,3	
4QSMAEX01	Introduction to Quantum Theory and Quantum Computing	12	W	1,3	1,3	
4INFBA033	Lab Computer Graphics (in German)	6	W	1	2	4INFBA020 4INFBA200
4INFMA200	Rendering	6	I	2	1-3	4INFBA020 4INFBA200
4INFMA206	Optimization for Machine Learning	6	S	2	1,3	4MATHBAEX01
4INFMA207	Numerical Methods for Visual Computing	6	W	1,3	2	4MATHBAEX01
4INFMA208	Machine Vision	6	S	2	1,3	4MATHBAEX01
4INFMA210	Virtual Reality	6	S	2	1,3	4INFBA020
4INFMA211	Higher Level Computer Vision	6	I	1-3	1-3	4INFBA004 4MATHBAEX01
4INFMA214	3D Machine Learning	6	W	1,3	2	4INFBA013 4INFBA020
4ETMA252/2	Topics in Computational Imaging	6	S[11]	2	1,3	
4DBHSBA02	Human Function II (in German)	9	S	2	1,3	4DBHSBA01
4DBHSBA22/2	Security in Medical Applications	6	W[12]	1,3	2	
4DMTBA09	Safety in Medical Applications (in German)	9	W[13]	1,3	2	
5BMTBA18	Immunology (in German)	6	W	1,3	2	
1DPHMA04	Methods in Public Health	9	W[14]	1,3	2	
2PSYBA08	General Psychology II (in German)	9	W	1,3	2	

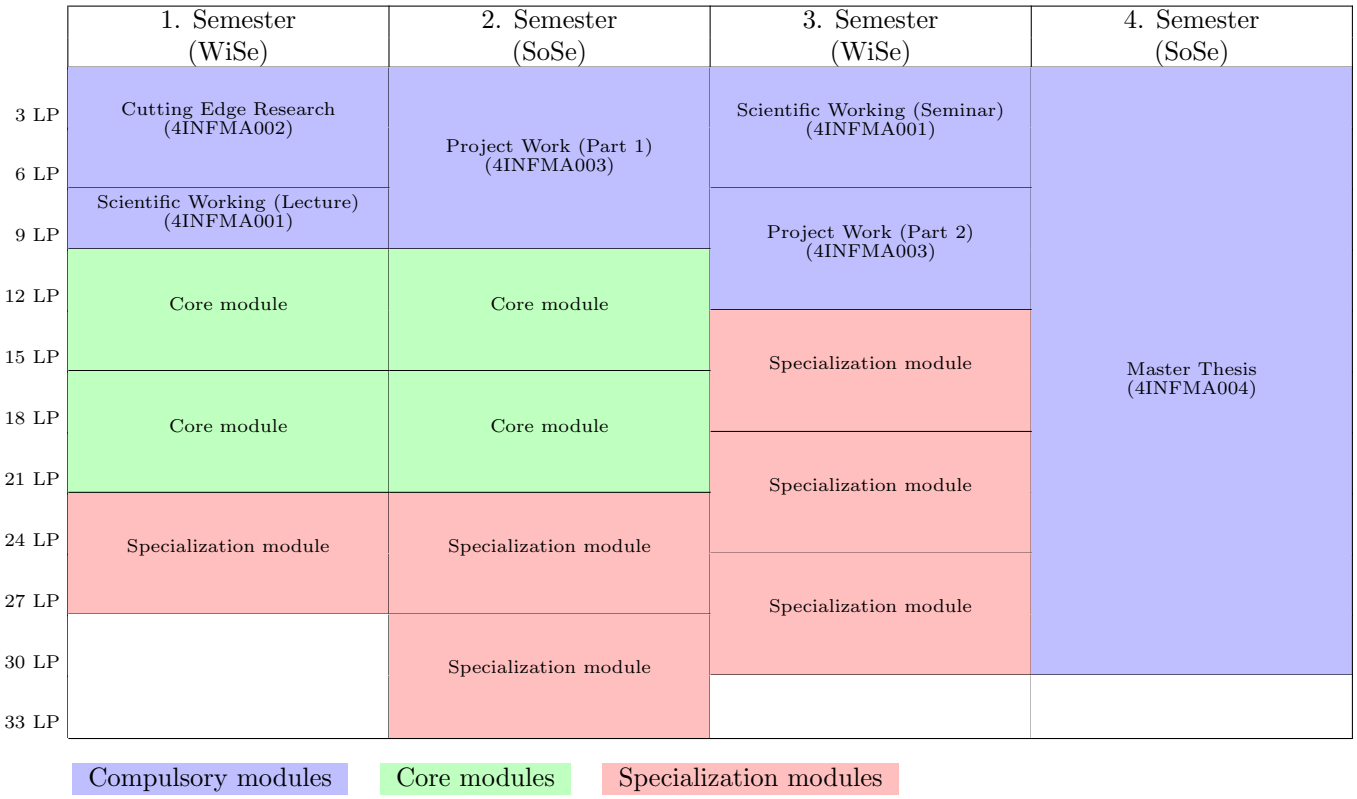
[9] Planned starting in winter term 26/27. If necessary, please register this course via the course search in unisono!
[10] Planned starting in winter term 26/27. If necessary, please register this course via the course search in unisono!
[11] Starting winter term 2026/27, this module includes a study achievement!
[12] Planned starting in winter term 27/28.
[13] This module will presumably be offered only until winter term 27/28.
[14] Planned starting in winter term 26/27.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
3HCIMA001	Humans & Technology (in German)	9	W	1,3	2	

3.4 Sample Study Plans

3.4.1 Start of Study in Winter Semester





3.4.2 Start of Study in Summer Semester

<table>
<tr><th></th><th>1. Semester
(SoSe)</th><th>2. Semester
(WiSe)</th><th>3. Semester
(SoSe)</th><th>4. Semester
(WiSe)</th></tr>
<tr><td>3 LP
6 LP</td><td>Core module</td><td>Cutting Edge Research
(4INFMA002)</td><td>Scientific Working (Seminar)
(4INFMA001)</td><td rowspan="6">Master Thesis
(4INFMA004)</td></tr>
<tr><td>9 LP
12 LP</td><td rowspan="2">Core module</td><td>Scientific Working (Lecture)
(4INFMA001)</td><td rowspan="2">Project Work (Part 2)
(4INFMA003)</td></tr>
<tr><td>15 LP
18 LP</td><td rowspan="2">Project Work (Part 1)
(4INFMA003)</td></tr>
<tr><td>21 LP
24 LP</td><td>Specialization module</td><td>Core module</td><td>Specialization module</td></tr>
<tr><td>27 LP
30 LP</td><td>Specialization module</td><td>Specialization module</td><td>Specialization module</td></tr>
</table>

<table>
<tr><th></th><th>1. Semester
(SoSe)</th><th>2. Semester
(WiSe)</th><th>3. Semester
(SoSe)</th><th>4. Semester
(WiSe)</th></tr>
<tr><td>3 LP
6 LP</td><td>Core module</td><td>Cutting Edge Research
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(4INFMA001)</td><td rowspan="6">Master Thesis
(4INFMA004)</td></tr>
<tr><td>9 LP
12 LP</td><td rowspan="2">Core module</td><td>Scientific Working (Lecture)
(4INFMA001)</td><td rowspan="2">Project Work (Part 2)
(4INFMA003)</td></tr>
<tr><td>15 LP
18 LP</td><td rowspan="2">Project Work (Part 1)
(4INFMA003)</td></tr>
<tr><td>21 LP
24 LP</td><td>Specialization module</td><td>Core module</td><td>Specialization module</td></tr>
<tr><td>27 LP
30 LP</td><td>Specialization module</td><td>Core module</td><td>Specialization module</td></tr>
</table>

Compulsory modules Core modules Specialization modules

3.5 Further Information

If you still have questions that are not answered here, please feel free to directly contact us:

	Prof. Dr. Roman Obermaisser
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E-Mail:	roman.obermaisser@uni-siegen.de

The safest way is to communicate by e-mail.

4 Specialization Visual Computing

4.1 Introduction: What is Visual Computing?

Visual Computing (VC) is an increasingly important part of our ever more visual world. Wherever images are processed in a commercial or media product, there is visual computing behind it. On the one hand, more and more information is being acquired with (image) sensors, which requires efficient evaluation and assessment of this data by humans and machines. Examples of this are autonomous driving, the steering and control of complex (production) processes or quality control. On the other hand, digitalization often requires the generation of virtual, image-based representations in order to make the variety of information accessible to humans. For example, visual representations play an important role for product development from design to technical planning and production to maintenance, but also for computer games or medical diagnostics. Visual computing was and is also one of the driving forces in the further development of machine learning and artificial intelligence, which thus belong to the methodological core areas of visual computing.

A technical definition:

> Visual computing deals with both the acquisition, processing and analysis of image data (image analysis) and the generation of images from data (image synthesis).

Requirements of Visual Computing

The fascination of dealing with images is a strong motivating factor for dealing with visual computing. One could put the course of studies under the motto

'What you see is what you want!'

because this names not only the fascination but also the challenges at the same time. Image synthesis and image analysis in many cases require an understanding and a model of the real world. For example, virtual objects can only be visualized if their shape (geometry) and appearance (material) are accurately described. Conversely, statements about the content of an image require suitable mathematical models, which can be used, for example, to answer the question of the presence of certain objects in the image.

Accordingly, an extended mathematical 'toolbox' is required, based on the classical disciplines of computer science, such as data structures and programming languages. In the master's program, this includes not only the basic mathematical disciplines (linear algebra, analysis and statistics/stochastics) but also fundamental knowledge of image processing, computer graphics and machine learning.

4.2 Job Profiles in the Field of Visual Computing

The basic techniques for image analysis and synthesis, which are necessary for the development and integration of systems for concrete application processes, are the focus of the job profile in visual computing. The main career paths are in image processing, computer vision, computer graphics, and machine learning.

In **image processing** (Fig. 4.1), the focus is on the recognition of relevant information and content of images and videos. The relevant parts of the image have e.g. to be extracted, recognized and measured. The fields of activity can be roughly divided into industrial and scientific image processing. Already established fields of work in industry are e.g. production control and automation, quality control, security and surveillance technology, earth exploration, medical image processing and pattern recognition.

The sensing of complex environments, e.g. for the control of autonomous systems or for the digital registration of real objects, is the central focus of the field of **machine vision / computer vision**. Such systems are used, for example, in the automotive industry (driver assistance systems) or in medicine (stereoscopic endoscopy). A special case of machine vision is the recognition of human gestures and facial expressions for **Human-Computer Interaction**, which is, for example, the prerequisite for the safe operation of (partially) autonomous vehicles or robots.

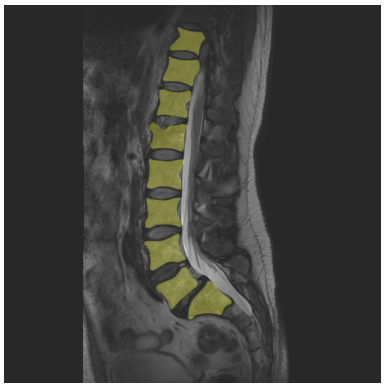


Figure 4.1: Segmentation of a spine in a magnetic resonance (MR) image.

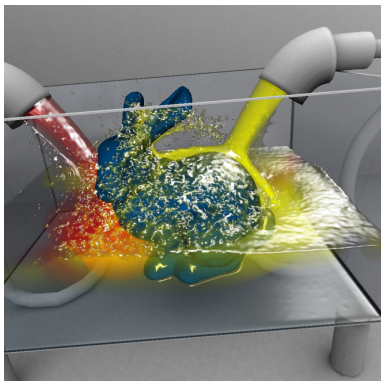


Figure 4.2: Visualization of a complex fluid simulation.

The focus of **image synthesis** (Fig. 4.2) is the (interactive) creation of images from computer-internal data. These data to be visualized usually originate from measurements (e.g. medicine, geology or astronomy), simulations (e.g. plant engineering, automotive or aircraft industry) or directly from image analysis (e.g. product design, film or television industry). The main focus of image synthesis is on visualization for the presentation of complex data from medicine and in engineering sciences, the creation of virtual simulations for design, planning and function checking e.g. of factory plants, automobiles or airplanes, as well as the realization of programs for the creation and editing of digital media ranging from photo and film/video to interactive media such as learning or video games.

4.3 Structure of the Study Program with Specialization in Visual Computing

In addition to the general mathematical and computer science competencies of a computer science bachelor's program, such as linear algebra (vector calculus), analysis (differential and integral calculus), and algorithmic and data technical concepts, as well as practical programming experience, the master's specialization Visual Computing builds on **specific prior knowledge from the field of visual computing**. Specifically, these include knowledge of theory and practice in computer graphics and digital image processing, as well as basic concepts of machine learning.

The master's program in the specialization Visual Computing itself offers a broad and very flexible choice of advanced modules in the areas of computer vision, computer graphics and machine learning. In addition to that, there are no specialization-specific structures or requirements.

4.3.1 Compulsory Modules (66 CP)

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA001_1	Scientific Working (Lecture)	3	W[1]	1	2	
4INFMA002	Cutting Edge Research	6	W	1	2	
4INFMA001_2	Scientific Working (Seminar)	6	E[2]	2,3	3	4INFMA001_1
4INFMA003	Project Work	15	E	2+3	2+3	
4INFMA004	Master Thesis	30	E	4	4	
4INFMA021	Modeling and Animation	6	W	1,3	2	4INFBA020 4INFBA200

4.3.2 Core Modules (18 CP)

A total of three modules must be selected from the following catalog. For the specialization 'Visual Computing', the modules marked with an asterisk (*) are particularly recommended.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA024	Parallel Processing*	6	W	1,3	2	4INFBA003 4INFBA004 4INFBA010 4INFBA011
4INFMA020	Software Engineering II	6	S	2	1,3	4INFBA007
4INFBA022/2	Introduction to Embedded Systems	6	S	2	1,3	4INFBA009
4INFMA023	Computer Architecture II	6	W	1,3	2	4INFBA010
4INFMA025	Computer Networks II (in German)	6	S	2	1,3	4INFBA012
4INFMA026	Advanced Logic	6	S	2	1,3	4INFBA005 4INFBA006
4INFMA028	Algorithmics I	6	W	1,3	2	4INFBA003 4MATHBAEX11
4INFMA029	Database Systems II	6	S	2	1,3	4INFBA008

4.3.3 Specialization Modules (36 CP)

The specialization modules offer the possibility to deepen the two core topics of visual computing, image synthesis (computer graphics) and/or image analysis (image processing), and if necessary to link them with the aspects of machine learning.

[1] Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!
[2] Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!

Modules amounting to at least 24 CP must be selected from the catalog 'Visual Computing' (see table below), for the remaining modules a free selection from all specialization catalogs as well as from the catalog 'Core Modules' is possible. In the sense of a clear focus, however, it is recommended to select these modules from the Visual Computing area as well.

Modules in the Catalog Visual Computing (24-36 CP)

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFBA033	Lab Computer Graphics (in German)	6	W	1	2	4INFBA020 4INFBA200
4INFMA200	Rendering	6	I	2	1-3	4INFBA020 4INFBA200
4INFMA202	Scientific Visualization	6	W	1,3	2	4INFBA020
4INFMA203	Statistical Learning Theory	6	S	2	1,3	4INFBA013
4INFMA204	Deep Learning	6	W	1,3	2	4INFBA013 4MATHBAEX01
4INFMA205	Recent Advances in Machine Learning	6	S	2	1,3	4INFBA013
4INFMA206	Optimization for Machine Learning	6	S	2	1,3	4MATHBAEX01
4INFMA207	Numerical Methods for Visual Computing	6	W	1,3	2	4MATHBAEX01
4INFMA208	Machine Vision	6	S	2	1,3	4MATHBAEX01
4INFMA210	Virtual Reality	6	S	2	1,3	4INFBA020
4INFMA211	Higher Level Computer Vision	6	I	1-3	1-3	4INFBA004 4MATHBAEX01
4INFMA212	Unsupervised Learning	6	W	1,3	1,3	4INFBA004 4MATHBAEX01
4INFMA213	Visual Analytics	6	S	2	1,3	4INFBA013
4INFMA214	3D Machine Learning	6	W	1,3	2	4INFBA013 4INFBA020
4INFMA215	Automated Machine Learning	6	S	2	1,3	4INFMA204
4INFBA502	Deep Learning Lab	6	W[3]	1,3	2	4INFBA004 4INFBA013
4ETMA250	Computational Imaging	6	W	1,3	2	
4ETMA252/2	Topics in Computational Imaging	6	S[4]	2	1,3	
4ETMA257	Introduction to Compressive Sensing	6	W	3		

Freely Selectable Modules (0-12 CP)

In case of special interest, a maximum of two modules (totaling a maximum of 12 CP) may be chosen from other specializations or from the catalog of core modules.[5]

In the following table all selectable modules of the other specializations are listed. It is recommended to choose the modules marked with an asterisk (*) which are clearly related to Visual Computing. In principle, the other modules can also be selected; however, it is explicitly not recommended to select the modules printed in gray.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA300	Algorithmics II*	6	S	2	1,3	4INFMA028
4INFMA305	Ubiquitous Computing*	6	E	1-3	1-3	
4ETMA168	Reinforcement Learning*	6	S	2	1,3	
4DBHSBA15	Data Science in Medicine (in German)*	6	W	1,3	2	

[3]Planned starting in winter term 26/27. If necessary, please register this course via the course search in unisono!
[4]Starting winter term 2026/27, this module includes a study achievement!
[5]see section 3.3.2. Of course, only modules that have not already been chosen as core modules may be selected

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA100	Development of Embedded Systems using FPGAs	6	W	1,3	2	4INFBA009 4INFBA010
4INFMA101	Lab Ubiquitous Systems	6	E	1-3	1-3	4INFBA003
4INFMA102	Storage Technologies	6	S	2	1,3	4INFBA009 4INFBA010
4INFMA301	Model Checking	6	W	1,3	2	4INFBA005 4INFBA006 4MATHBAEX11
4INFBA302	Complexity Theory I	6	W	1,3	2	4INFBA006
4INFMA304	Complexity Theory II	6	I	1-3	1-3	4INFBA302
4INFMA307	Advanced Programming in C++	6	S	2	1,3	4INFBA003
4INFMA308	Theoretical Computer Science	6	W	1,3	2	4INFBA005 4INFBA006
4INFMA312	Recommender Systems (in German)	6	W	1,3	2	4INFBA004 4INFBA013
4INFMA313	Quantum Complexity Theory	6	S	2	1,3	4INFBA302
4INFMA401	Knowledge Management	6	W[6]	1,3	2	
4ETMA160	Reliability of Technical Systems	6	S	2	1,3	
4ETMA167/2	Data Science for Dynamic Systems	6	W[7]	1,3	2	
4ETMA200/2	Advanced Signals and Systems I	6	W	1,3	2	
4ETMA201/2	Advanced Signals and Systems II	6	S	2	1,3	4ETMA200/2
4ETMA303	Digital IC Design	6	S	2	1,3	4INFBA009
4DBHSBA10	Telematics - Technologies and Applications	6	S	2	1,3	
4DBHSBA22/2	Security in Medical Applications	6	W[8]	1,3	2	
4DMTBA04	Medical Technology	6	S	2	1,3	
4DMTBA09	Safety in Medical Applications (in German)	9	W[9]	1,3	2	
4DMTBA19	Telematics - Multimedia	6	W[10]	1,3	2	
4MBMA052	Condition Monitoring	6	W	1,3	2	
4QSMAEX01	Introduction to Quantum Theory and Quantum Computing	12	W	1,3	1,3	
3HCIMA001	Humans & Technology (in German)	9	W	1,3	2	
4ETBA004	Grundlagen der Signal- und Systemtheorie (in German)	6	S[11]	2	1,3	
4ETMA159	Assembly and Interconnection Technology (in German)	6	S	2	1,3	
4ETMA263	Selected Topics in Wireless Technologies	6	S	2	3	
4ETMA355/2	Microsystem Fabrication & Test	6	W[12]	1,3	2	
4DBHSBA02	Human Function II (in German)	9	S	2	1,3	4DBHSBA01
5BMTBA18	Immunology (in German)	6	W	1,3	2	
1DPHMA04	Methods in Public Health	9	W[13]	1,3	2	
2PSYBA08	General Psychology II (in German)	9	W	1,3	2	

[6] Planned starting in winter term 26/27. If necessary, please register this course via the course search in unisono!
[7] Starting winter term 2026/27, this module does no longer include a study achievement.
[8] Planned starting in winter term 27/28.
[9] This module will presumably be offered only until winter term 27/28.
[10] This module will presumably be offered only until winter term 27/28.
[11] Planned starting in winter term 26/27.
[12] Starting winter term 2026/27, this module includes a study achievement!
[13] Planned starting in winter term 26/27.

4.4 Sample Study Plans

4.4.1 Start of Study in Winter Semester

	1. Semester (WiSe)	2. Semester (SoSe)	3. Semester (WiSe)	4. Semester (SoSe)
3 LP	Cutting Edge Research (4INFMA002)	Scientific Working (Seminar) (4INFMA001)	Project Work (Part 2) (4INFMA003)	Master Thesis (4INFMA004)
6 LP				
9 LP	Scientific Working (Lecture) (4INFMA001)	Project Work (Part 1) (4INFMA003)	Specialization module	
12 LP	Modeling and Animation (4INFMA021)			
15 LP			Specialization module	
18 LP	Core module	Core module		
21 LP			Specialization module	
24 LP	Core module	Specialization module		
27 LP			Specialization module	
30 LP	Specialization module			
33 LP				

	1. Semester (WiSe)	2. Semester (SoSe)	3. Semester (WiSe)	4. Semester (SoSe)
3 LP	Cutting Edge Research (4INFMA002)	Project Work (Part 1) (4INFMA003)	Scientific Working (Seminar) (4INFMA001)	Master Thesis (4INFMA004)
6 LP				
9 LP	Scientific Working (Lecture) (4INFMA001)		Project Work (Part 2) (4INFMA003)	
12 LP	Modeling and Animation (4INFMA021)	Core module		
15 LP			Specialization module	
18 LP	Core module	Core module		
21 LP			Specialization module	
24 LP	Specialization module	Specialization module		
27 LP			Specialization module	
30 LP		Specialization module		
33 LP				

Compulsory modules Core modules Specialization modules

4.4.2 Start of Study in Summer Semester

	1. Semester (SoSe)	2. Semester (WiSe)	3. Semester (SoSe)	4. Semester (WiSe)
3 LP	Core module	Cutting Edge Research (4INFMA002)	Scientific Working (Seminar) (4INFMA001)	Master Thesis (4INFMA004)
6 LP				
9 LP	Core module	Scientific Working (Lecture) (4INFMA001)	Project Work (Part 2) (4INFMA003)	
12 LP		Project Work (Part 1) (4INFMA003)		
15 LP	Core module		Specialization module	
18 LP				
21 LP	Specialization module	Modeling and Animation (4INFMA021)	Specialization module	
24 LP				
27 LP	Specialization module	Specialization module	Specialization module	
30 LP				

	1. Semester (SoSe)	2. Semester (WiSe)	3. Semester (SoSe)	4. Semester (WiSe)
3 LP	Core module	Cutting Edge Research (4INFMA002)	Scientific Working (Seminar) (4INFMA001)	Master Thesis (4INFMA004)
6 LP				
9 LP	Core module	Scientific Working (Lecture) (4INFMA001)	Project Work (Part 2) (4INFMA003)	
12 LP		Project Work (Part 1) (4INFMA003)		
15 LP	Specialization module			
18 LP		Modeling and Animation (4INFMA021)	Core module	
21 LP	Specialization module			
24 LP		Specialization module	Specialization module	
27 LP	Specialization module			
30 LP		Specialization module		
33 LP				

Compulsory modules Core modules Specialization modules

4.5 Further Information

If you still have questions that are not answered here, please feel free to directly contact us:

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The safest way is to communicate by e-mail.

5 Specialization Complex and Intelligent Software Systems

5.1 Introduction: What are Complex and Intelligent Software Systems?

Complex and intelligent software systems are now an integral part of our everyday lives. Whether it's a smartphone, a (self-driving) car, or a supermarket checkout, complex and intelligent software systems are running everywhere. However, depending on the area of application and target group of the software, the requirements, technologies used, and basic organizational conditions can vary considerably. Nevertheless, on closer inspection, fundamental principles can be identified for developing almost any modern software system in an analytical, creative, and constructive manner.

The specialization in Complex and Intelligent Software Systems teaches core competencies for the scientifically sound yet practice-oriented development and maintenance of modern software systems. The ability to think abstractly and enjoy analytical thinking are particularly important, but teamwork and strong communication skills are also crucial. Students learn to understand and precisely describe problems and requirements, select and apply current solutions, critically evaluate their suitability, and further develop them if necessary. Not only are current techniques taught in a practical manner, but the theoretical foundations are also covered so that students can independently acquire future concepts and techniques beyond current trends.

The two characteristics that give this specialization its name, *complex* and *intelligent*, are both drivers of innovation in modern software and, at the same time, the greatest challenges to its controllability.

The holistic approach to the complexity and intelligence of software systems is a cross-cutting topic that is reflected in all fundamental disciplines of computer science – from programming, to the design of algorithms and data structures, to software engineering tools and machine learning methods. The specialization covers the relevant topics for acquiring the corresponding skills.

5.2 Job Profiles in the Field of Complex and Intelligent Software Systems

Graduates of the Complex and Intelligent Software Systems specialization have excellent career prospects with a wide range of possible fields of application – namely, anywhere where complex and intelligent software is used and plays a significant role.

Job titles include: software developer, machine learning engineer, IT project manager, software architect, research engineer, head of research, quality manager, and test manager.

The degree also provides an excellent foundation for a doctorate in computer science with a scientific specialization, e.g., in the field of software engineering or machine learning. The fields of activity range from large international corporations and research institutions to small and medium-sized enterprises and start-ups.

5.3 Structure of the Study Program with Specialization in Complex and Intelligent Software Systems

The Complex and Intelligent Software Systems specialization builds on the skills acquired in the bachelor's program in the areas of programming, software engineering and practical computer science, machine learning, and the fundamentals of theoretical computer science.

5.3.1 Compulsory Modules (72 LP)

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA001_1	Scientific Working (Lecture)	3	W[1]	1	2	
4INFMA002	Cutting Edge Research	6	W	1	2	
4INFMA020	Software Engineering II	6	S	2	1,3	4INFBA007
4INFMA029	Database Systems II	6	S	2	1,3	4INFBA008
4INFMA001_2	Scientific Working (Seminar)	6	E[2]	2,3	3	4INFMA001_1
4INFMA003	Project Work	15	E	2+3	2+3	
4INFMA004	Master Thesis	30	E	4	4	

Note: The modules 'Software Engineering II' and 'Database Systems II' are only compulsory for students who began their studies in the winter semester 2024/25 or later. However, all other students are also strongly recommended to choose these modules in the core area.

5.3.2 Core Modules (12 LP)

A total of two modules must be selected from the following catalog. For the specialization 'Complex and Intelligent Software Systems, the modules marked with an asterisk (*) are particularly recommended.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA020	Software Engineering II*	6	S	2	1,3	4INFBA007
4INFMA024	Parallel Processing*	6	W	1,3	2	4INFBA003 4INFBA004 4INFBA010 4INFBA011
4INFMA028	Algorithmics I*	6	W	1,3	2	4INFBA003 4MATHBAEX11
4INFMA029	Database Systems II*	6	S	2	1,3	4INFBA008
4INFMA021	Modeling and Animation	6	W	1,3	2	4INFBA020 4INFBA200
4INFBA022/2	Introduction to Embedded Systems	6	S	2	1,3	4INFBA009
4INFMA023	Computer Architecture II	6	W	1,3	2	4INFBA010
4INFMA025	Computer Networks II (in German)	6	S	2	1,3	4INFBA012
4INFMA026	Advanced Logic	6	S	2	1,3	4INFBA005 4INFBA006

5.3.3 Specialization Modules (36 LP)

The specialization modules offer the opportunity to delve deeper into the two core topics of the specialization, namely the development of complex software systems and the use of machine learning methods to implement intelligent

[1] Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!
[2] Starting in winter term 2026/27, you must pass study achievment of the lecture before you can take part in the seminar!

systems, and, where appropriate, to link these with theoretical principles and aspects of embedded systems and visual computing.

Modules worth at least 18 LP must be selected from the catalog 'Complex and Intelligent Software Systems' (see table below). For the remaining modules, students are free to choose from all specialization catalogs and the catalog 'Core Modules'.

If you wish to specialize in the core topic 'Intelligent Software Systems', we strongly recommend that you take the module '4INFMA312 Recommender Systems' from the following catalog, as well as the two modules '4INFMA204 Deep Learning' and '4INFMA205 Recent Advances in Machine Learning' from the freely selectable modules.

Modules in the Catalog Complex and Intelligent Software Systems (18-36 LP)

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA300	Algorithmics II	6	S	2	1,3	4INFMA028
4INFMA301	Model Checking	6	W	1,3	2	4INFBA005 4INFBA006 4MATHBAEX11
4INFBA302	Complexity Theory I	6	W	1,3	2	4INFBA006
4INFMA304	Complexity Theory II	6	I	1-3	1-3	4INFBA302
4INFMA305	Ubiquitous Computing	6	E	1-3	1-3	
4INFMA307	Advanced Programming in C++	6	S	2	1,3	4INFBA003
4INFMA308	Theoretical Computer Science	6	W	1,3	2	4INFBA005 4INFBA006
4INFMA312	Recommender Systems (in German)	6	W	1,3	2	4INFBA004 4INFBA013
4INFMA313	Quantum Complexity Theory	6	S	2	1,3	4INFBA302
4ETMA168	Reinforcement Learning	6	S	2	1,3	
4QSMAEX01	Introduction to Quantum Theory and Quantum Computing	12	W	1,3	1,3	

Freely Selectable Modules (0-18 LP)

A maximum of three modules (totaling a maximum of 18 CP) may be chosen from other specializations or from the catalog of core modules.[3]

In the following table all selectable modules of the other specializations are listed. It is recommended to choose the modules marked with an asterisk (*) which are clearly related to Complex and Intelligent Software Systems, with the two modules '4INFMA204 Deep Learning' and '4INFMA205 Recent Advances in Machine Learning' being expressly recommended for the focus area 'Intelligent Software Systems'. In principle, the other modules can also be selected; however, it is explicitly not recommended to select the modules printed in gray.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFMA101	Lab Ubiquitous Systems*	6	E	1-3	1-3	4INFBA003
4INFMA203	Statistical Learning Theory*	6	S	2	1,3	4INFBA013
4INFMA204	Deep Learning*	6	W	1,3	2	4INFBA013 4MATHBAEX01
4INFMA205	Recent Advances in Machine Learning*	6	S	2	1,3	4INFBA013
4INFMA212	Unsupervised Learning*	6	W	1,3	1,3	4INFBA004 4MATHBAEX01
4INFMA401	Knowledge Management*	6	W[4]	1,3	2	

[3] see section 5.3.2. Of course, only modules that have not already been chosen as core modules may be selected.
[4] Planned starting in winter term 26/27. If necessary, please register this course via the course search in unisono!

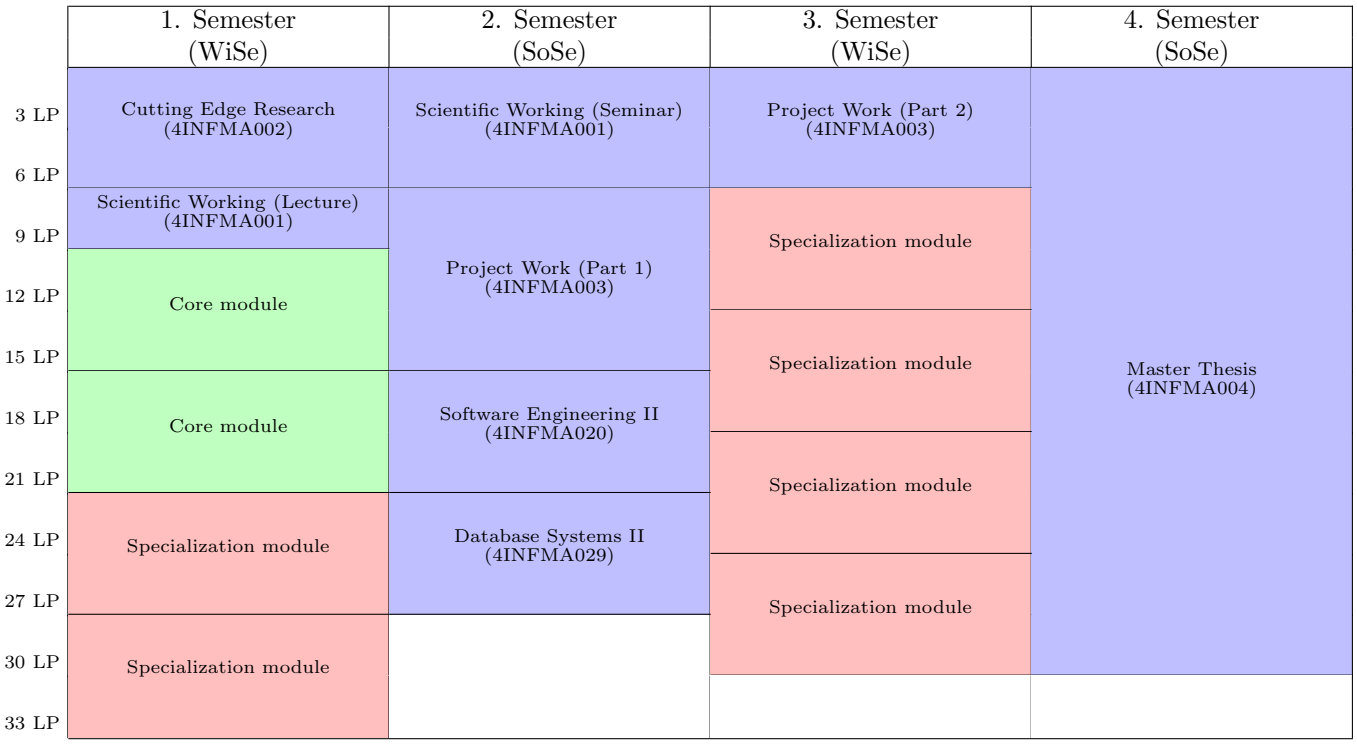
No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
4INFBA502	Deep Learning Lab*	6	W[5]	1,3	2	4INFBA004 4INFBA013
4INFBA033	Lab Computer Graphics (in German)	6	W	1	2	4INFBA020 4INFBA200
4INFMA102	Storage Technologies	6	S	2	1,3	4INFBA009 4INFBA010
4INFMA200	Rendering	6	I	2	1-3	4INFBA020 4INFBA200
4INFMA202	Scientific Visualization	6	W	1,3	2	4INFBA020
4INFMA208	Machine Vision	6	S	2	1,3	4MATHBAEX01
4INFMA210	Virtual Reality	6	S	2	1,3	4INFBA020
4INFMA213	Visual Analytics	6	S	2	1,3	4INFBA013
4INFMA214	3D Machine Learning	6	W	1,3	2	4INFBA013 4INFBA020
4INFMA215	Automated Machine Learning	6	S	2	1,3	4INFMA204
4ETMA160	Reliability of Technical Systems	6	S	2	1,3	
4ETMA167/2	Data Science for Dynamic Systems	6	W[6]	1,3	2	
4DBHSBA10	Telematics - Technologies and Applications	6	S	2	1,3	
4DBHSBA15	Data Science in Medicine (in German)	6	W	1,3	2	
4DBHSBA22/2	Security in Medical Applications	6	W[7]	1,3	2	
4DMTBA04	Medical Technology	6	S	2	1,3	
4DMTBA09	Safety in Medical Applications (in German)	9	W[8]	1,3	2	
4DMTBA19	Telematics - Multimedia	6	W[9]	1,3	2	
4MBMA052	Condition Monitoring	6	W	1,3	2	
3HCIMA001	Humans & Technology (in German)	9	W	1,3	2	
4INFMA100	Development of Embedded Systems using FPGAs	6	W	1,3	2	4INFBA009 4INFBA010
4INFMA206	Optimization for Machine Learning	6	S	2	1,3	4MATHBAEX01
4INFMA207	Numerical Methods for Visual Computing	6	W	1,3	2	4MATHBAEX01
4INFMA211	Higher Level Computer Vision	6	I	1-3	1-3	4INFBA004 4MATHBAEX01
4ETBA004	Grundlagen der Signal- und Systemtheorie (in German)	6	S[10]	2	1,3	
4ETMA159	Assembly and Interconnection Technology (in German)	6	S	2	1,3	
4ETMA200/2	Advanced Signals and Systems I	6	W	1,3	2	
4ETMA201/2	Advanced Signals and Systems II	6	S	2	1,3	4ETMA200/2
4ETMA250	Computational Imaging	6	W	1,3	2	
4ETMA252/2	Topics in Computational Imaging	6	S[11]	2	1,3	
4ETMA257	Introduction to Compressive Sensing	6	W	3		
4ETMA263	Selected Topics in Wireless Technologies	6	S	2	3	
4ETMA303	Digital IC Design	6	S	2	1,3	4INFBA009
4ETMA355/2	Microsystem Fabrication & Test	6	W[12]	1,3	2	
4DBHSBA02	Human Function II (in German)	9	S	2	1,3	4DBHSBA01
5BMTBA18	Immunology (in German)	6	W	1,3	2	
1DPHMA04	Methods in Public Health	9	W[13]	1,3	2	

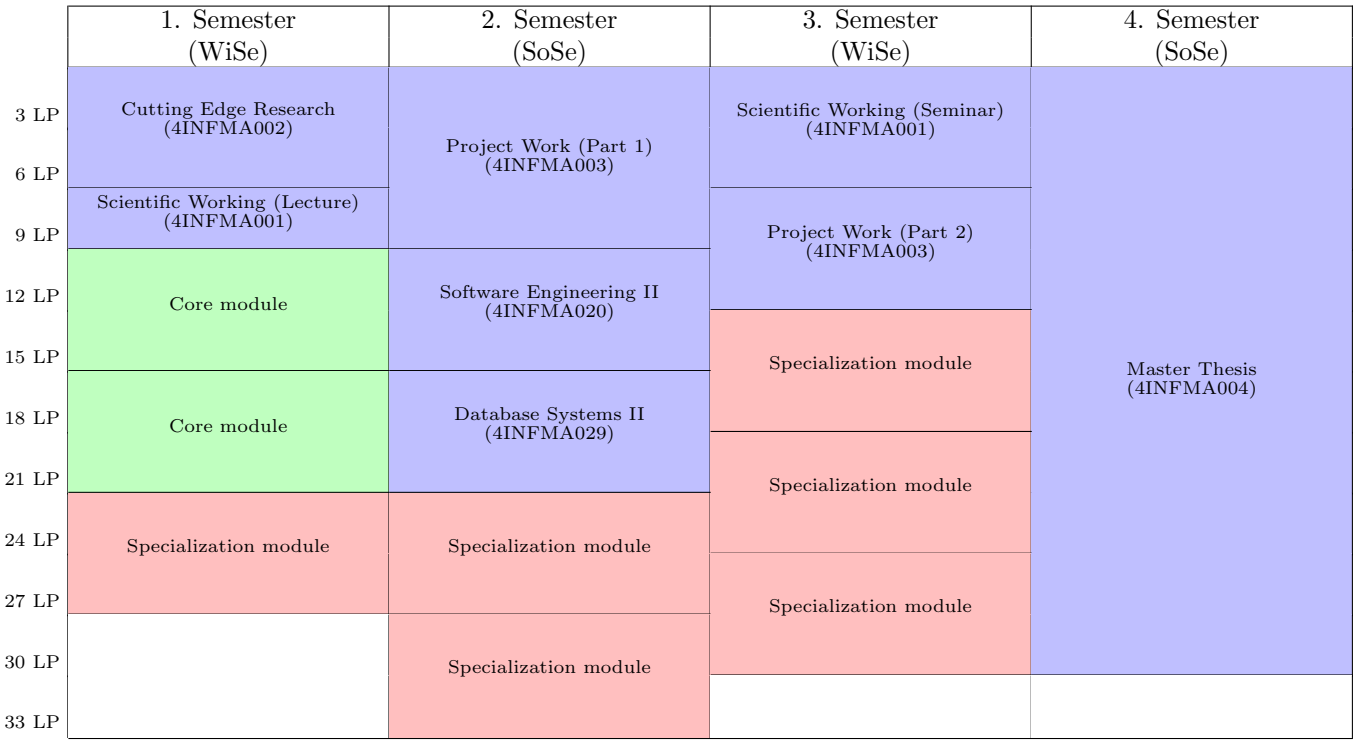
[5]Planned starting in winter term 26/27. If necessary, please register this course via the course search in unisono!
[6]Starting winter term 2026/27, this module does no longer include a study achievement.
[7]Planned starting in winter term 27/28.
[8]This module will presumably be offered only until winter term 27/28.
[9]This module will presumably be offered only until winter term 27/28.
[10]Planned starting in winter term 26/27.
[11]Starting winter term 2026/27, this module includes a study achievement!
[12]Starting winter term 2026/27, this module includes a study achievement!
[13]Planned starting in winter term 26/27.

No.	Module	CP	Sem.	S.Wi.	S.Su.	Requirements
2PSYBA08	General Psychology II (in German)	9	W	1,3	2	

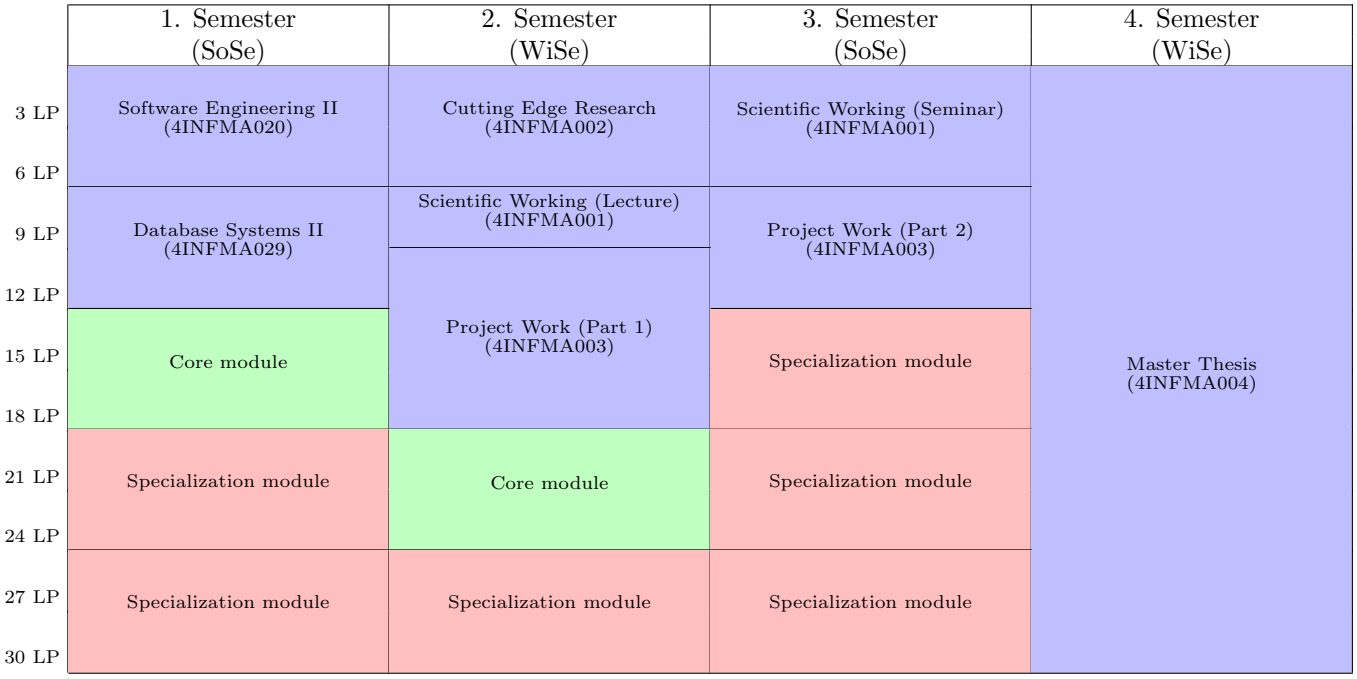
5.4 Sample Study Plans

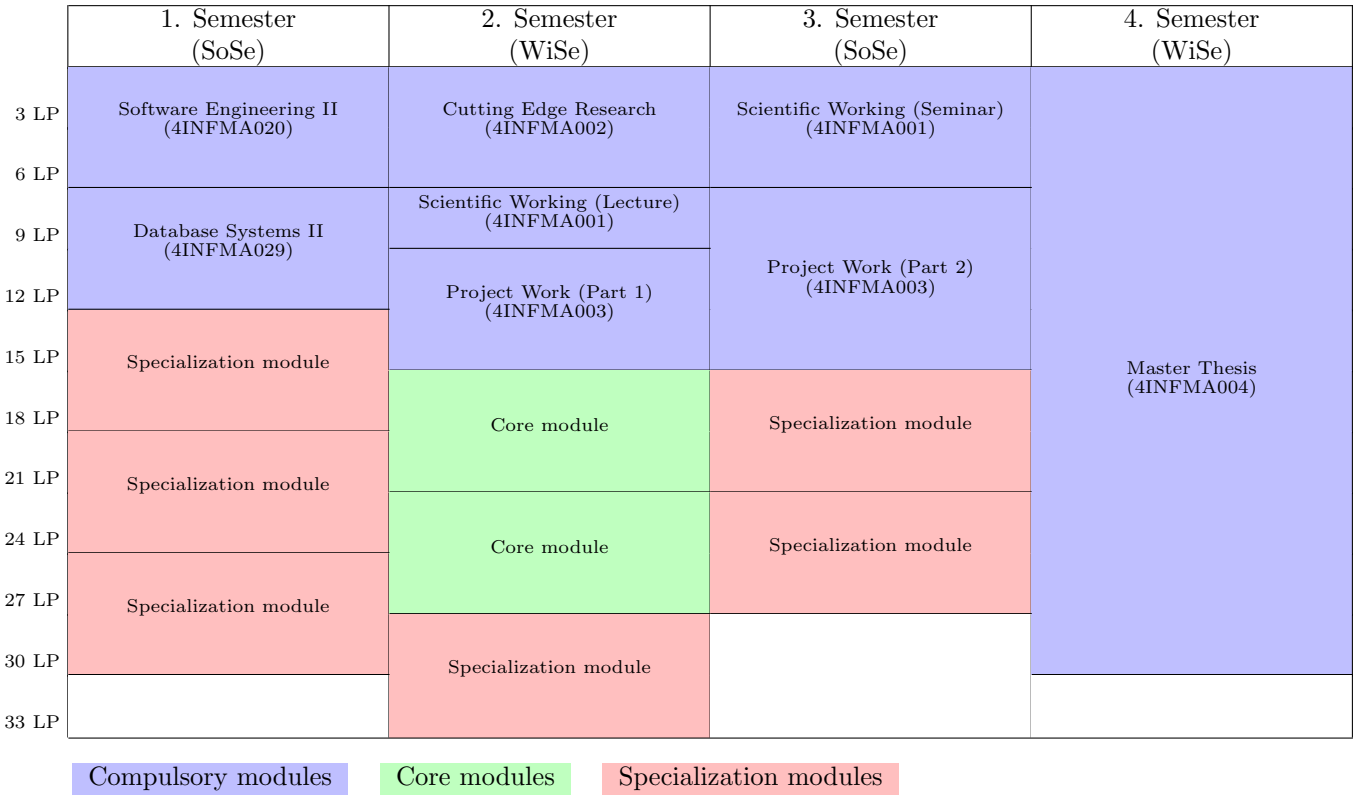
5.4.1 Start of Study in Winter Semester





5.4.2 Start of Study in Summer Semester





5.5 Further Information

If you still have questions that are not answered here, please feel free to directly contact us:

	Prof. Dr. Malte Lochau	Prof. Dr. Jöran Beel
Raum:	H-C 8329/2	H-C 8315
Tel.:	0271 / 740-2611	0271 / 740-3593
E-Mail:	malte.lochau@uni-siegen.de	joeran.beel@uni-siegen.de

The safest way is to communicate by e-mail.

6 Information for New International Students

As an international student who wants to study Computer Science in Siegen, please be sure to inform yourself about studying and living in Siegen, using among others the following websites:

- `https://www.uni-siegen.de/en/%20prospective%20students`
  General Information for prospective students at the University of Siegen, including information on admission, accomodation, etc.
- `https://www.uni-siegen.de/eti-international-master-in-computer-science`
  Specific information for international students of Computer Science.
- `https://www.uni-siegen.de/en/ETI/pruefungsamt-informatik`
  Information on examination matters, campus management, and more. Have a look at the box "Information for New Students".

If you have been admitted to the Master studies in Computer Science, but will not be able to arrive in Siegen before the beginning of the lecture term (usually the first week of October) due to, e.g., Visa issues, please be aware of the following rules and procedures:

- You must be enrolled by the beginning of the lecture term in order to take part in the study program.
- You have to register for each course in the campus management system *unisono* (`https://unisono.uni-siegen.de`, see Section 7.1) at the very beginning of the lecture term, even if you are not present in Siegen.
- In addition, please contact the lecturer before the start of the lecture term and ask if it is possible to participate remotely.

  In many cases, lecturers provide study material online, e.g., via the *moodle* learning platform (`https://moodle.uni-siegen.de`). Access to a course in *moodle* requires a registration. The registration information is usually provided by the lecturer via email to all student who are already registered for the course in the campus management system *unisono*.

  Further notes:

  - In most cases, the option to participate remotely is limited to the first few weeks of a lecture term.
  - In many courses you have to hand in exercises solutions to get admitted to the final exam. These solutions often can be handed in electronically, e.g., via *moodle*.
  - In almost all cases it is **not possible** to join a course after the first few weeks, so you need to actively study from the very beginning, even though you are not in Siegen.

7 Important Organizational Information

This section summarizes important legal and organizational regulations of the program to assist you in starting your studies. However, it does not replace your obligation to inform yourself about the Examination Regulations, the Framework Examination Regulations and the current announcements of the Examination Office!

7.1 Enrollment in Courses

If you wish to study a module in a semester, you must register in the campus management system *unisono* (`https://unisono.uni-siegen.de`) for the courses belonging to that module in good time before the semester begins.[1]

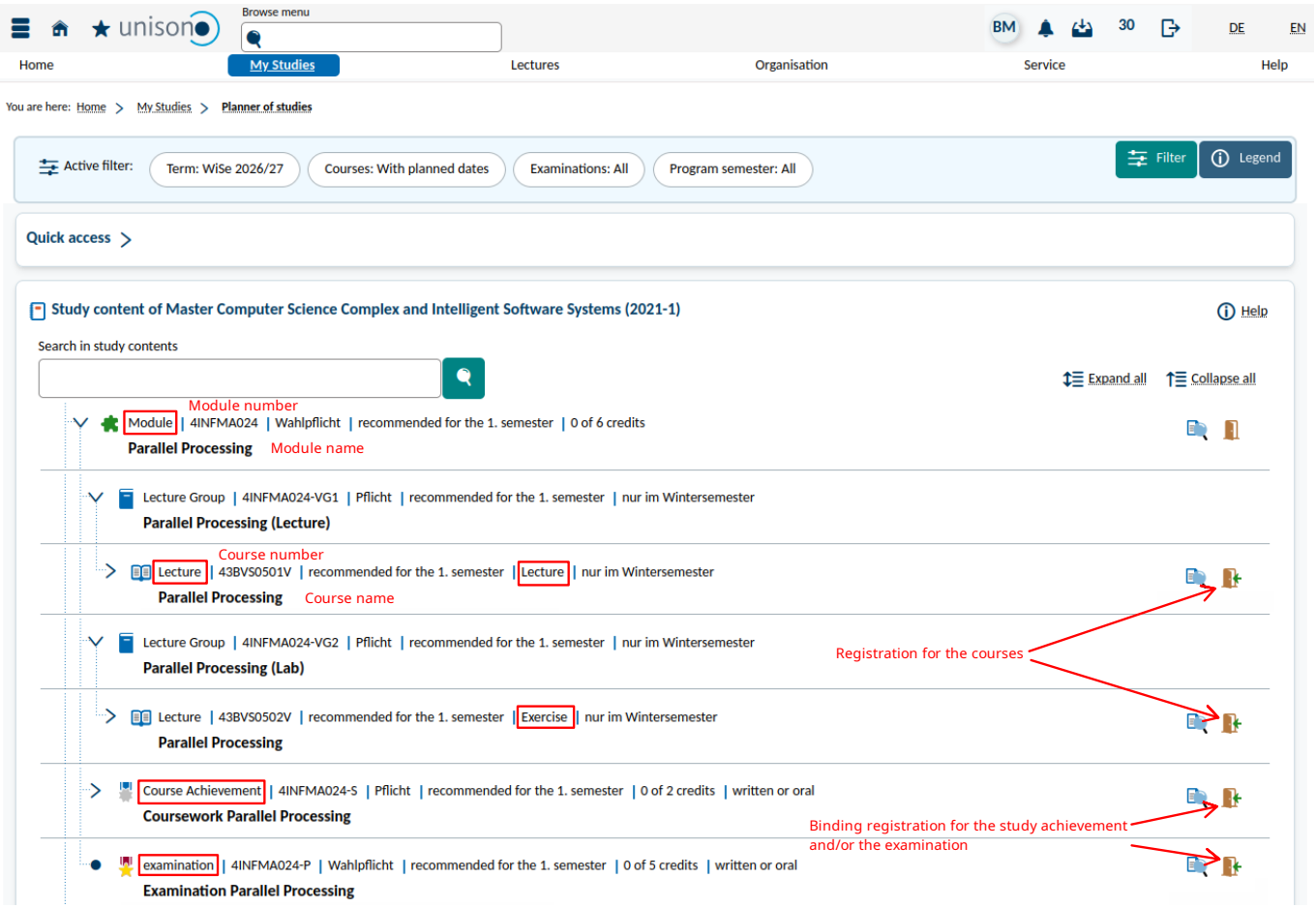


Figure 7.1: View of the curriculum in the campus management system *unisono*

The easiest way to do this is to select 'My Studies / Planner of studies' in *unisono*, see fig. 7.1. You will then see a list of all modules. If you click on the '>' for a module, you will see the courses for that module. Courses that are actually offered in the selected semester can be recognized by the '>' (in contrast to a '•') on the left side of the lecture group, as well as – only during the enrollment phases – by the button '⇥'. If a course (e.g. an exercise in small groups) is offered more than once at different times, you can (and should) select multiple dates when registering. If possible, you will then be assigned to one of the selected dates according to the priority you have indicated in each case.

[1] There are two registration periods: the first is approximately from 8 to 4 weeks before the semester starts, and the second is approximately from two weeks before until immediately before the semester starts.

Please note that the registration for the courses of a module is completely independent from the registration for study achievements and examinations. So please do not forget to register separately for the study achievements and examinations!

In some cases, you may not be able to register for a course using the module overview shown in Fig. 7.1 (for example, if you have already earned enough credit points in the corresponding catalog or if the course is not (yet) available for selection in the catalog). In such cases, you can always register for the course you want using the course search function in *unisono*.

7.2 Examinations and Study Achievements

Most modules are completed with an **examination**. Examinations are graded and can only be repeated to a limited extent (see section 7.2.1). The grade of the examination, weighted by the CP number of the module, is used for computing the final grade of the transcript. In the Master's program, examinations are often conducted as oral examinations, the dates of which can be arranged individually with the examiner. In addition, however, there are also written examinations (in paper-based or electronic form) in some modules during the lecture-free period, term papers or laboratory reports. Finally, the master thesis (see section 7.5) also represents an examination achievement.

As a rule, study achievements (also called 'course work') are completed during the semester and can be repeated as often as required if they are not passed. They may be graded, but the grade is not part of the final grade on the transcript. In some modules, e.g. in many laboratory courses, there is only a study achievement, in others there may be one or more study achievements in addition to an examination. In this case, all achievements must be completed in order to successfully pass the module. In some cases, passing the study achievement is also a prerequisite for registration/admission to the examination (so-called 'examination prerequisite', sometimes also called 'preliminary examination'). However, the study achievement does not have to be completed in the same semester as the examination.

Which examination and/or study achievements must be completed for a module, and whether an examination prerequisite is required, can be found in the authoritative module descriptions in the FPO-M Informatik. A list of all modules with prerequisite examinations can additionally be found in §9, section 3 of the FPO-M Informatik. Please note that the offical document is in German, however, there is an inofficial English translation.

7.2.1 Repetition of Examinations

Within the standard period of study, if you fail an examination **at the first attempt** or are not satisfied with the grade, you can have this attempt subsequently evaluated as a **free attempt** for up to three examinations. In this case, you can take the exam again (in the case of written exams at the next offered date, in the case of oral exams within 6 months), in which case the better result counts. **Please note that the general rule regarding free attempts in the General Examination Regulations (§12a) does not apply to the computer science program!**

You can **retake** an examination that you have failed a maximum of two times **in the regular way** (i.e. without counting any free attempts)[2]. The third and last attempt for written examinations of modules offered by the department ETI[3] will thereby take the form of an oral examination, unless you explicitly do not wish to do so.

The following applies to the **master thesis**: You can return the topic only once within the first four weeks of the processing period. In case of non-passing, the master thesis can be repeated at most once.

If you should **ultimately fail** a module, the following regulations apply:

- If it is a compulsory module (modules 4INFMA001 to 4INFMA003) or the master thesis, you cannot continue your studies.

[2] If you have already repeated an exam once regularly, you can no longer take a free attempt. A second free attempt for the same examination is also not possible.

[3] that is, for modules whose module number begins with '4INF' or '4ET'.

- If it is an elective module, you can choose a substitute module twice in total. If necessary, there is also the one-time possibility to change the specialization.

7.2.2 Registration for Examinations

In order to take an examination, it is **mandatory** to register in advance and **in due time**. Registration for **written** examinations must take place **at least 14 days before the examination date**, and for **oral** examinations **at least 7 days before the examination date**. The deadlines are **hard**; without timely registration you will not be allowed to take the exam! Please note that registration is only valid for the semester in which you registered.

Note that for exams on imported **modules from other programs**[4] other deadlines may apply. In these cases, please contact the Examination Office of the offering study program for information.

Registration for exams is usually done via the campus management system *unisono* (exceptions see below) using the button '', which is displayed to the right of the exam during the registration period, see fig. 7.1. If you open the sub-items for the study achievements or examinations, you will see important additional information on the achievements, in particular the **registration deadlines**, see fig. 7.2. Upon successful registration, you will receive a message via the unsono system. If the registration is not successful, please contact the Examination Office immediately.

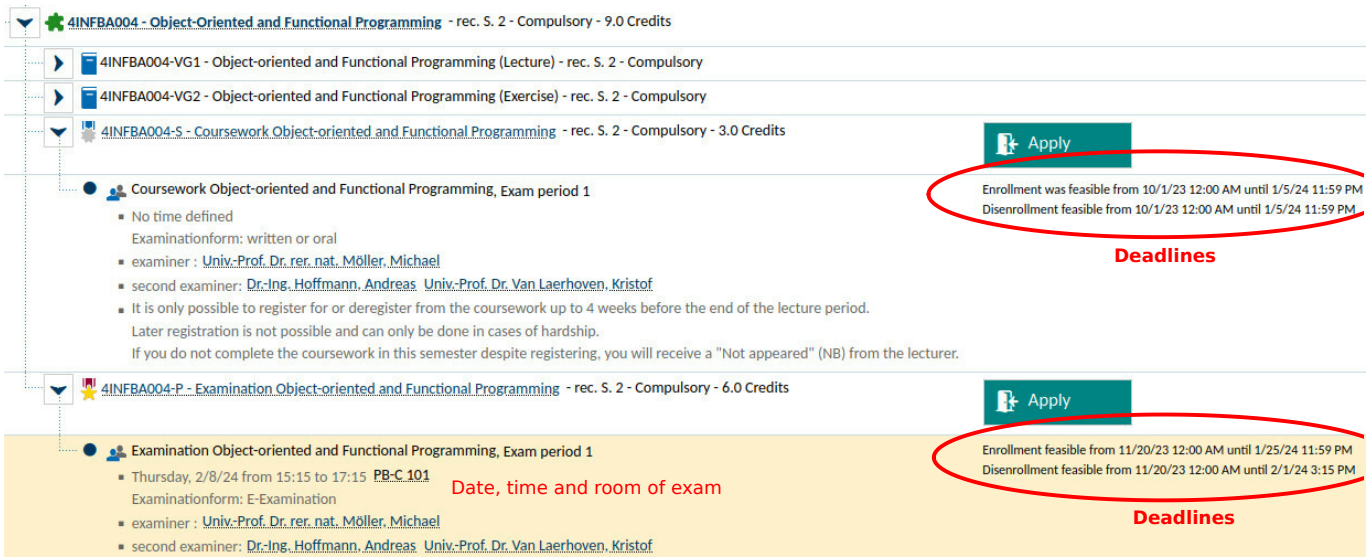


Figure 7.2: Registration and information on study achievements and examinations in *unisono*

For **oral exams**, please arrange an individual exam appointment with the examiner **after** registering in *unisono*. Note that registering for an oral exam in a particular semester means that you must also take the exam in that semester, otherwise the exam will be considered failed at the end of the semester! Therefore, you have to deregister in time (i.e. at least 8 days before the end of the semester) if necessary (see section 7.2.4).

Remember that for modules that require a study achievement as a prerequisite for the examination, registration for the examination is only possible if you have already successfully completed this study achievement.

Registration **via the Examination Office** is required for:

- **Free attempts:** Please use the provided form.
- **Third attempts:** Please also use the provided form. Since the third attempt at the exam will be oral, please be sure to indicate that it is a third attempt when making the appointment with the examiner. **Additional required examinations (see 7.6)**: Please also use the provided form for this. The examinations are usually conducted orally.

[4] identifiable by a module number that does not begin with '4INF' or '4ET'.

- **Master thesis:** Please register this with the appropriate form, which you must complete together with your master thesis supervisor.

In the case of elective modules, registration for the examination is also associated with the mandatory choice of the corresponding module, see section 7.4.

7.2.3 Registration for Study Achievements

Please inform yourself at the beginning of the semester whether and in which form a study achievement (possibly as a prerequisite for the examination) has to be completed in the modules you have taken. You must also register for the study achievement in *unisono* (see fig. 7.1). The **registration deadline** will be announced by the lecturer. The important fact is that you cannot submit a (partial) achievement without prior registration!

The registration for a study achievement is not linked to the registration for the corresponding course! This means that registration for the course does not automatically include registration for the study achievement.

In the case of elective modules, however, registration for a study achievement is also linked to the selection of the corresponding module, although in this case the selection can be cancelled, see section 7.4.

If you realize in the course of the semester that you do not want to or cannot complete a course after all, please deregister in good time before the end of the semester.

7.2.4 Cancellation and Withdrawal

If you have registered for an examination, you can cancel your registration up to **7 days** before the start of the examination (exact time!) via *unisono* without giving reasons (button 'Sign Off' to the right of the examination).

If you are unable to attend or complete an examination due to illness or another important reason, you must prove the reasons in writing to the Examination Office within three working days of the examination date, e.g. by means of a doctor's certificate. In this case, please use the Examination Office's withdrawal form.

If you fall ill while working on your master thesis, please report your incapacity to work immediately to the Examinations Office with a doctor's certificate. The processing time will then be extended accordingly.

If you have registered in one semester for a study achievement or an oral examination for which no date has (yet) been issued, but do not want to take this study achievement or examination in this semester, please deregister at least 8 days before the end of the semester. Otherwise, the study achievement or examination will be considered as failed at the end of the semester due to non-participation!

7.3 Choice of Specialization

The choice of specialization in the Master's program is already made at the time of enrollment. It can be changed once upon request via the Examination Office.

7.4 Choice of Elective Modules

Elective modules are all modules that are not compulsory modules, i.e. all modules except 4INFMA001 to 4INFMA004. You can choose these modules according to your personal interest (and, possibly, depending on the chosen specialization). Please note that the modules you select from a catalog must collectively earn **exactly** the catalog's prescribed number of credit points; exceeding the number of credit points is not permitted.

The choice of a module is made in unisono by by registering for the corresponding course (see section 7.1) or an

examination (see section 7.2.2) or a study achievement (see section 7.2.3) in this module. It is important to note that the choice of module cannot be undone once the first attempt to obtain the examination has been made. Attempts in which you did not participate without an important reason also count (see section 7.2.4). If, on the other hand, you have 'only' made an attempt for the study achievement in a module (or just have registered for the course), you may opt out of the module.

If you finally fail the examination in an elective module, you can choose another module as a substitute. However, this is only allowed twice in total. If it is a module that you have to take in your specialization, you can also change the specialization once.

If you want to enrol for a course of a specialization module in *unisono* or register for an examination or study achievement for a specialization module, the system may ask you for which module group you want to choose the module:

- for the module group 'Compulsory elective area Core Modules' or the module group 'Other mandatory elective modules [...]'
- for the module group 'Module Catalog [...]' (own specialization) or the module group 'Other mandatory elective modules [...]'

Please always choose the first option here (core modules or module catalog of your respective specialization).[5]

7.5 Master Thesis

In the master thesis, which should usually be done in the last semester of study, you work independently on a given topic within a period of 26 weeks (approx. 6 months) and document the results both in writing and in the form of a presentation.

You can start with the master thesis if you have achieved at least 60 CP in your studies and are not in the last attempt in any examination. If you are looking for a topic for your master thesis, please contact the lecturers independently (via the websites or personally, if necessary). All professors of the Department ETI are admitted as topic providers (first examiners), as well as some professors of other departments or faculties.

The right to issue a master thesis lies exclusively with the university; however, in agreement with the first examiner (and only then!) a master thesis can also be carried out in cooperation with an external company. In this case, please refer to the department's handout for conducting external theses.

Before you start the work, it must be registered with the Examination Office using the appropriate form. After completion, the work must then be submitted to the Examination Office by the deadline, preferably in person. You have to hand in two copies of the printed and bound thesis text (max. 120 pages), each of them with

- a data carrier with the thesis text as a PDF file as well as all other parts of the thesis that are to be evaluated (i.e. in particular program code created),
- a signed declaration, included in your thesis text, that you have written the work independently.

After handing in the thesis, you still have to give an approx. 20-minute talk followed by a discussion in which you present your work.

7.6 Additional Required Examinations

Your admission to the Master's degree program may be subject to the condition that you catch up on certain modules from the Bachelor's degree in Computer Science at the University of Siegen. These additional requirements should be

[5] The query has technical reasons: the examination regulations are mapped in unisono in a way that you have to choose a fixed number of CPs from your respective specialization and you can choose a fixed number of CPs arbitrarily. Therefore, there are often two ways to credit a module. If you always choose the module (as long as this is possible) from the core modules or the module catalog of your respective specialization, you won't do anything wrong. Otherwise you might limit your free choice of modules.

fulfilled in the first two semesters of your Master's degree course and must be proven at the latest when you register for the Master's thesis. The required exams can usually be taken orally, which allows for flexible scheduling. In some modules, however, the exams are in written form and are offered only once per semester. To register, please submit the provided form to the Examination Office.

Please check with the lecturer of the relevant modules well in advance to find out about preparation options and exam procedures. If you do not know the lecturer, the Examination Office will be happy to assist you.

7.7 Recognition of Credits

If you have already acquired academic or examination achievements at another university, these can be recognized for your studies upon application, provided that there is no significant difference between the acquired competencies and the corresponding achievements in the Master Computer Science. In such cases, please inform yourself at the Examination Office.

7.8 Times of Absence, Compensation for Disadvantages and Hardship Cases

Your studies will always require you to meet deadlines or to perform achievements in a given time and in a given form. If you have objective reasons why this is not possible for you (e.g. acute or chronic illness or disability, but also maternity leave, parental leave or caring for relatives), please contact the Examination Office, a mentor, or the head of the examination board. We will do our best to support you as far as possible in such cases.

8 Planned Changes to the Degree Program for the winter semester 26/27

The following lists the changes to the degree program that are **expected** to take effect in the winter semester 26/27. These changes have already been incorporated into the other sections of this brochure to help you plan your studies.

Please note, however, that these are **plans** that were not yet legally binding at the time of printing. Although the changes can generally be implemented exactly as documented here, unfortunately no guarantee can be given that this will be the case.

Modules No Longer Offered / Discontinued:

- 4INFMA104 Selected Chapters in Processor Architectures
  Will no longer be offered until further notice.
- 4INFMA200 Rendering
  Will no longer be offered until further notice.
- 4DBHSBAEX02 Clinical Internship
- 4MDSMA02 Medical Technology Specialization

Important Changes to Modules:

- 4INFMA001 Scientific Working
  Starting in the winter semester 26/27, successful completion of the lecture component (block course in February or March) is a **prerequisite for admission** to the seminar component!
- 4INFMA023 Computer Architectures II
  Changes to the course content and the type of study achievement.
- 4DMTBA09 Safety in Medical Applications
  The 9 CP module and the associated exam will only be offered until the end of the winter semester 27/28. Starting in winter semester 27/28, the module (with new number 4DBHSBA22/2) will be offered for 6 CP.
- 4ETMA355/2 Microsystem Fabrication & Test
  The module requires a study achievement starting in the winter semester 26/27.
- 4ETMA252/2 Topics in Computational Imaging
  This module requires a study achievement starting in the winter semester 26/27.

New Module Offerings:

- 4INFBA502 Deep Learning Lab
  Module catalog ‘Visual Computing’.
- 4ETBA004 Fundamentals of Signal and System Theory
  Module catalog ‘Embedded Systems’.
- 4DBHSBA22/2 Security in Medical Applications
  Module catalog ‘Medical Informatics’; offered starting in the winter semester 27/28.

- 1DPHMA04 Methods in Public Health
  Module catalog ‘Medical Informatics’.
- 4INFMA401 Knowledge Management
  Module catalog ‘Medical Informatics’.

If you do not yet see the new modules listed in the module tree in *unisono*, you can register for the corresponding courses using the course search.

9 Module Descriptions

PDF documents with the detailed module descriptions of all modules of the Computer Science Master can be found in the campus management system unisono (only in German!).

- Specialization Embedded Systems.
- Specialization Visual Computing.
- Specialization Complex and Intelligent Software Systems.

In addition, the links behind the module numbers in this document will lead you directly to the corresponding module description in unisono (unfortunately, also these descriptions are mainly in German).

You can find module descriptions in English in the inofficial (and probably sometimes a bit outdated) English translation of the examination regulations.