

Computational Sciences Master Program – WS23/24

Information for the 1. Semester

Computational Sciences

Modern experimental techniques generate larger and larger datasets, and simulation and modeling of complex systems has become an important tool in various fields of science. Examples include machine learning and modeling of neural networks in **Computational Biology**, climate and weather predictions in the **Earth System Sciences**, simulation of plasmas in **Astro- and Space Physics**, simulation of atoms and molecular bonds in **Theoretical Chemistry**, and the numerical solution of many-body problems in **Theoretical Condensed-Matter Physics**.

The master program in **Computational Sciences** will directly incorporate research activities with computational methods and aims to answer new questions in the natural sciences. Within this interdisciplinary, research-oriented master program, you will obtain the skills required for modern, computational research methods in numerous scientific fields, among other students from different scientific backgrounds. You will be trained equally well in **Simulation Science**, **Computer Science** and **Applied Mathematics** as well as your selected **Area of Specialization**.

Successful completion of the program will provide you with the qualifications to start a PhD within your respective Area of Specialization.

University degree: Master of Science (M.Sc.)

Credit points: 120 ECTS

Standard period of study: 4 semesters (2 years)

Start of study: Winter semester

Teaching language: English

Faculty: Faculty of Mathematics and Natural Sciences

Overview of the Study Program

Semester	Compulsory Modules total 18 CP	Mathematics/ Computer Science total 18 CP	Specialization total 78 CP	Supplementary Contents total 6 CP
1	Simulation & Modeling 1 9 CP	Elective Mathematics / Computer Science Area 18 CP	Specialization Area 30 CP	Suppl. Module 6 CP
2	Simulation & Modeling 2 9 CP			
3			Literature Seminar 6 CP	Project Work 12 CP
4			Master Thesis 30 CP	

The curriculum is divided into four thematic areas:

Simulation and Modeling 1 and 2 will provide the necessary basis ranging from numerical modeling to machine learning which is needed in the areas of specialization. These two modules are specifically designed for the Computational Sciences master program. Both modules employ practical examples from all areas of specialization where you will apply the learned computational methods. *Simulation and Modeling 1* and *2* give **9 CP each** and are **intended for the first and second semester**, respectively.

The **Elective Mathematics and Computer Science Area** allows you to widen your knowledge in more specific topics of mathematics and computer science. In agreement with your respective mentor, you choose modules that benefit you in your Area of Specialization and especially in your future research work. Therefore, you can choose from a range of modules offered by the different Departments of the Faculty of Mathematics and Natural Sciences. The Area consists of a **total of 18 CP** and **may range from the first to third semester**.

The study in the **Area of Specialization**, consists of class work in the *Specialization Area* with **30 CP** that **may go from first to third semester**, and the *Research Part* that consists of three compulsory modules: the *Literature Seminar* with **6 CP**, the *Project Work* with **12 CP intended for the third semester** (both in preparation for the Master thesis) and the *Master Thesis* with **30 CP** in the **fourth semester**.

In the *Specialization Area*, you study courses from your chosen Area of Specialization. In four Areas of Specialization, you have to attend **two compulsory modules** that form the basis for your studies. The combination of the two modules consists of either 12 or 15 CP (depending on the Area of Specialization). The remaining Credit Points may be chosen from a catalogue of modules in the

respective specialization. The Area of Specialization *Earth System Sciences* has **no compulsory modules** due to the diversity of the research area within this specialization. Therefore, you have to elect courses with a total of 30 CP from basic and advanced modules. The choices in the elective area should reflect your personal interest in certain research fields and may be chosen together with your respective mentor.

The *Research Part* of the Computational Sciences master program consists of three consecutive modules: the *Literature Seminar* (6CP), the *Project Work* (12CP) and the *Master Thesis* (30CP). All three modules are compulsory for all students and deal with **the same research topic where you conduct your own research** in one of the research groups of your Area of Specialization. All three modules give a total of 48 CP for the *Research Part* of your master and are intended for 2 semesters (the third and fourth). In other words, the *Research Part* is intended for a whole year and you should **make sure that you are set with your supervisor and research topic a year prior to the end of your master** (i.e. before you start with the literature research in the *Literature Seminar*).

The ***Supplementary Module*** consists of **6 CP** and **can be placed freely in the first three semesters** of the master's course. You may choose freely from a wide range of modules, including (but not limited to) courses offered by *Excellence Startup Center Gateway*, the Digital Humanities, or the area of Mathematics and Computer Science and any Area of Specialization. If you wish to take a course outside these areas, please contact the coordinator of the study program and clarify, whether it is eligible for the *Supplementary Module*.

Course and Exam Registrations

KLIPS2.0

At the University of Cologne, all course and exam registrations are managed through the *KLIPS2.0* online system. You already have used the *KLIPS2.0* portal during your application for the study program and the enrolment process.

You can access the online portal via <https://klips2.uni-koeln.de> and log in with your student (small) account. Then select “My Degree Program” in order to view the module structure of the study program. Click the “plus” symbol to expand module areas and find the courses of your choice. In order to register for a course, click the small green arrow icon next to the course title (only available while the registration period is open), and confirm your registration.

Node filter-Name	rec. sem.	Credits	Duration	WF	Results	Sel	Pass										
[20222] Computational Sciences		120	4	1			P										
[Simulation and Modeling]		18		1			P										
[5904MSiMo1] BM Simulation and Modeling 1		9		1			P										
[5904MSiMo1] Vorlesung		-		1			P										
<table border="1"><thead><tr><th>Examination(s) in academic year</th><th>Part/Exam</th><th>Lecturer (Assistant)</th><th>Place (1st session)</th><th>Time (1st session)</th></tr></thead><tbody><tr><td>2023/24</td><td>14904.4011 23W 3SH L Simulation and Modeling 1 - Lecture</td><td>Düben P, Schemann V</td><td>410 Seminarraum 3.136 (32 Sitzpl.) (410/03 /3.136)</td><td>11.10.23 10:30 - 12:00</td></tr></tbody></table>								Examination(s) in academic year	Part/Exam	Lecturer (Assistant)	Place (1st session)	Time (1st session)	2023/24	14904.4011 23W 3SH L Simulation and Modeling 1 - Lecture	Düben P, Schemann V	410 Seminarraum 3.136 (32 Sitzpl.) (410/03 /3.136)	11.10.23 10:30 - 12:00
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[5904MSiMo1] Übung				1			P										
[5904MSiMo1] Modulprüfung				1			P										
[5904MSiMo2] BM Simulation and Modeling 2		9		1			P										
Mathematics/Computer Science		18		1			P										
Specialization Area		30		1			P										
Supplementary Contents		6		1			P										
Master Thesis		30		1			P										
[UZK1ExAn00] Extracurricular Courses				0													

General information on how to use the *KLIPS2.0* system you can find here:

<https://klips2-support.uni-koeln.de/en/students-new-design>

ILIAS

On the E-Learning Platform *ILIAS* you find course materials, exercise sheets and more, that are provided by lecturers for your respective courses. In order to get access to courses on *ILIAS*, you first need to be registered for the course in the *KLIPS2.0* portal, as both systems are synchronized.

Note: being registered for a course in *ILIAS* does **not** count as an official course registration. In order to be guaranteed a spot in a course, make sure you register via *KLIPS2.0* within the respective registration period!

Registration Periods

Before the start of each term, there are specific time windows when registration for courses via *KLIPS2.0* is open. Make sure you get in touch with your mentor to discuss your course choices **before** each registration period ends! The exact dates can be found on this website:

<https://klips2-support.uni-koeln.de/en/klips-20-support/news-and-dates>

Note: if you have missed to register for a course during the registration periods, you may still register at the start of lectures, provided there are still free spots left for the course of your choice. In this case, please talk to the course lecturer and contact the coordinator of the study program.

Sign-Up for Exams

Once you have registered for a course via the *KLIPS2.0* system, you will also need to register for the respective examination, in order to take part in a written or oral exam and receive the credits upon successful course completion. Please note the registration deadlines for module examinations of each semester. You can find these in *KLIPS2.0* as soon as exams have been set.

Due to the fact that Computational Sciences is an interdisciplinary master program, various examination offices are involved in setting up the exams and entering the results. So please expect that not all exam dates will be published in *KLIPS2.0* at the same time.

IMPORTANT: A special case are all modules that are preceded by the code number 5871 in *KLIPS2.0* (e. g. “[5871CComBL] Computational Biology”). The courses of these modules are administered by the respective department (e.g. Biology), while the examinations have to be administered by the examination office of the Department of Geosciences. This technical division involves organizational challenges.

Please support us by registering for module examinations with reference number 5871 within the first three weeks of lectures! We will create “blank module examinations” for this in relevant modules. This tells us in which modules you would like to take an exam and we can clarify all the exam’s details with the department in charge. Cancellations will of course still be possible later during the semester (within the respective cancellation deadlines).

Mentoring Program

General information

All students who have been admitted to the Computational Sciences master program will be assigned a “mentor”. These mentors are researchers/teachers from the Area of Specialisation that you elected upon application for the study program. Mentors help their mentees with selecting courses for their curriculum and shall guide you throughout your studies in Computational Sciences.

There are 2 mandatory mentor-mentee meetings per term:

1. Before the start of each term (to discuss the selection of modules)
2. During the term (for general discussion)

Guidelines

Before enrolment: After you have received the admission letter for the Computational Sciences master program, you will receive a notification about your assigned mentor. We would like to invite you to get in touch with your mentor before you enroll for your study program, and they will guide you on your first steps. **Please make sure you contact your mentor as soon as possible, BEFORE the first sign-up period for courses starts!** You and your mentor will then discuss together your plans for your curriculum and which courses are most suitable for you.

Start of each term: Before each term of your studies, you will sign up for the courses that you are going to take. Your mentor will advise you and help finding the courses that are most suitable for your curriculum. Please make sure that you contact your mentor well in advance before the sign-up period for courses opens!

During your studies: Please contact your mentor at least once during the term, to check-in on your study progress and potential questions/adjustments regarding your curriculum.

Other: In the case that questions/struggles may arise (also independent of your studies), your mentor is one of many people at University of Cologne you can reach out to, and who will help you with further steps that you can take. In addition, find a list of other services at UoC below:

Central Student Guidance and Counselling Services	General questions to the study programs of the University of Cologne, the choice of subjects, etc.
Student Application and Registration Office	Questions concerning immatriculation, Response, etc.
Kölner Studierendenwerk	Social aspects in connection to studying
ASTA	Students' union
International Office	For international students
Gender Equality Officer	gender equality, family friendliness, internationalization, interculturality, accessibility, and educational equality

Note: You will be assigned a mentor upon admission to the Computational Sciences master program, however, you may ask for a reassignment at any point throughout your studies! In that case, please contact the coordinator of the study program.

Contacts and other useful Information

Coordinator of the Study Program

For general inquiries please contact:

info-compscie@uni-koeln.de

Examination Office

The examination office that administers the Computational Sciences master program is the examination office of the *Department of Geosciences*. This is independent of the Area of Specialization that you have chosen for your curriculum and applies to all interdisciplinary modules listed in the Module Handbook that are part of study programs at other departments.

For information and questions regarding exams and course registrations please contact:

geo-pruefungsamts@uni-koeln.de

Examination Board

The master examination board is responsible for all provisions and decisions concerning the master course, especially for the regulations of examinations and the acceptance of course and examination achievements.

List of current members, including the student representative(s):

<https://computationalsciences.uni-koeln.de/help-and-advice/examination-board>

Speakers of the Specialisation Areas

Each of the Specialisation Areas in the Computational Sciences master program has an official speaker. The speakers support the coordination of the interdisciplinary study program across multiple departments within the Faculty of Mathematics and Natural Sciences.

List of current speakers:

<https://computationalsciences.uni-koeln.de/help-and-advice/speakers>

Mentors

Mentors help their mentees with selecting courses for their curriculum and shall guide you throughout your studies in Computational Sciences.

You have received contact details for your mentor after receiving your letter of admission to the study program.

Institutes

Computational Sciences is an interdisciplinary master program that involves various departments across the Faculty of Mathematics and Natural Science. Hence, your courses will take place at many different institutes across the University of Cologne. You can find the building numbers for the location of your courses in *KLIPS2.0*, and use this interactive campus map for navigation:

<https://lageplan.uni-koeln.de/>

The lectures for the compulsory modules *Simulation and Modeling 1+2* take place in the Institute for Geophysics and Meteorology (building 410, Pohligstr. 3, 3rd floor). Here you also find the examination office, and other administrative staff for the Computational Sciences master program.

Mailing List

After enrolling to the Computational Sciences master program, you will be added to a designated mailing list with your student account (your @smail.uni-koeln.de email address). You will receive important announcements and information throughout your studies via this list.

Please make sure you are subscribed to info-msc-cs@uni-koeln.de for the entire duration of your master studies!

Website

All important information about the Computational Sciences master program can be found on this website:

<https://computationalsciences.uni-koeln.de/>