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# MATHEMATICAL MODELING, SIMULATION AND OPTIMIZATION (M. SC.)

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## Admission Requirements

### Who can apply for MMSO (M. Sc.)?

Applicants who hold a Bachelor degree in mathematics, physics or computer science that is recognized by the examination committee, are entitled to apply for in the Master's degree program "Mathematical Modelling, Simulation, and Optimization". Moreover, applicants who have completed the Bachelor degree program "Mathematical Modeling" at the University of Koblenz-Landau can apply for the Master program.

Only candidates with a final grade of at least 2.5 (German grading system) in the Bachelor degree program will be accepted; the examination committee will decide on exceptions on application.

Candidates can also enrol in the Master's degree program " Mathematical Modelling, Simulation, and Optimization" if the official transcript of the Bachelor's examination has not yet been issued. However, all examinations will have been taken before the start of the Master's degree program, and the examination is likely to be awarded a grade of 2.5. If evidence of compliance with the admission requirements has not been provided by the end of the first semester, any such enrollment will be considered null and void.

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### How do I apply for MMSO?

The application procedure depends on different criteria. Most international applicants have to apply via [uni-assist](#), an independent organization. The main task of uni-assist is the evaluation of international school/university certificates in regard to their equivalence to German school/university degrees. Whether you have to apply via uni-assist or directly via the university depends on which group of applicants you belong to.

Please note that you need to pay a processing fee for the online application. Information on payment and bank account details can be found on the website of the [Welcome Center](#). You are also required to send a signed copy of your application and the certified documents by mail to uni-assist.

Applications can only be considered after the timely submission of all documents in the required form and payment of the processing fee.

Decisive for timely submission is the "received-by" date indicated by uni-assist, not the postmarked date. Please note that applications that are not received by mail before the deadline or are incomplete are not considered for approval.

It takes up to 8 weeks until you get the admission letter by email if you are accepted. If you are admitted to the study program, you will be provided with information regarding the further steps.

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## Where can I find more information about how to apply, accommodation, visa and entry requirements, etc.?

For more information please visit the website of the Welcome Center of the University of Koblenz-Landau, campus Koblenz: <https://www.uni-koblenz-landau.de/en/international-en/support-contact/welcome-center>

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## Which prior knowledge is required to study MMSO at the University of Koblenz-Landau?

Complex, cross-linked systems pervade our daily life e.g. in natural sciences, engineering, life sciences, or logistics. The key to tackle the challenges imposed by these systems is mathematical modeling in a broad sense which is based on an advanced knowledge of

- Mathematics
  - Physics
  - Computer Science.
- 

## What happens if the examination committee establishes that I do not possess specific required prior knowledge?

It may require that you acquire the missing achievements that may be equivalent to up to 30 credit points within two semesters. The critical factor when determining such additional requirements is the decision with regard to your suitability to successfully complete the Master's degree program and not your knowledge of all aspects of the Bachelor degree program "Mathematical Modeling". Candidates may only register for the Master's thesis if they also meet any additional requirements that have been imposed.

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## Which level of English is required to apply for the Master program?

A requirement for admission to the Master's degree program is a knowledge of English that is at least equivalent to Level B2 of the Common European Framework of Reference for Languages (equivalent to TOEFL of at least 72 points or IELTS of at least 5.0 points). Evidence can be provided either in the form of a school-leaving qualification, a degree in the corresponding languages or corresponding certificates.

## Job prospects

### How can MMSO help me in my employability?

The need for qualified scientists in the MINT sector continues unabated in all areas of society. Having experienced this unique program in mathematical modeling, graduates will be generalists rather than specialists: Due to your application-oriented and cross-sectional studies you will get a wide spectrum of knowledge and skills. Thanks to your sound education in mathematical methods and your knowledge in modern software tools you will be the versatile and conjunctive backbone of interdisciplinary teams coping with future challenges.

Consequently you will find interesting fields of work in various industrial sectors and interesting positions in major companies addressing e.g. engineering, consulting or finance. Alternatively you can also pursue a PhD in mathematics, physics, or computer science.

Thanks to the faculty's large network, MMSO students can access a large pool of companies from industry and technology, thus completing internships during their studies and, above all, making contact with potential employers.

If you are still wondering what to do with a mathematics degree later on, [this](#) article might be useful for you.

## Studying in General

### How much time should I plan in for the MMSO M.Sc.?

You will need **at least** 4 semesters (=2 years) to successfully complete the Master program of MMSO.

### Do you provide a schedule?

There is no fixed schedule, but we provide a recommended schedule to the students (see figure 1.1 and 1.2 below). In general, students have the possibility to set their own priorities in their studies by choosing between specific elective courses. A certain amount of self-responsibility and the ability to study independently is expected for Master students at German universities.

### How many courses do I have to take every semester?

You can take as many courses per semester as you like. As a start, you should follow our recommended timetable and then adjust the pace to your individual need. Approximately, you should get 30 credits per semester.

Course Guide Master Program (M.Sc.)  
 „Mathematical Modeling of Complex Systems“  
 for students starting in the winter semester

Sem.	recommended order of study for the master program starting in winter							LP
7 W	Applied Differential Equations 9 LP			Physics in applications	Computer based methods	Advance Mathematics	possibility for studying abroad	30
8 S	Optimization 9 LP	Numerics of Partial Differential Equations 9 LP		Physics in applications	Computer based methods	Advance Mathematics		30
9 W		Optimization 2 9 LP	Project seminar 15 LP	Physics in applications	Computer based methods	Advance Mathematics		30
10 S	Master thesis 30 LP							30
<b>M.Sc.</b>								<b>120</b>

Figure 1.1

Course Guide Master Program (M.Sc.)  
 „Mathematical Modeling of Complex Systems“  
 for students starting in the summer semester

Sem.	recommended order of study for the master program starting in summer							LP
7 S	Optimization 9 LP			Physics in applications	Computer based methods	Advance Mathematics	possibility for studying abroad	30
8 W	Applied Differential Equations 9 LP	Optimization 2 9 LP		Physics in applications	Computer based methods	Advance Mathematics		30
9 S		Numerics of Partial Differential Equations 9 LP	Project seminar 15 LP	Physics in applications	Computer based methods	Advance Mathematics		30
10 W	Master thesis 30 LP							30
<b>M.Sc.</b>								<b>120</b>

Figure 1.2

### Which modules are elective and which are compulsory?

Compulsory modules (26 SWS/ 51 CP) are:

<b>03MA2501</b>	Applied Differential Equations	6 SWS	9 CP
<b>03MA2502</b>	Optimization	6 SWS	9 CP
<b>03MA2503</b>	Numerics for Partial Differential Equations	6 SWS	9 CP
<b>03MA2504</b>	Optimization 2	6 SWS	9 CP
<b>03XX2501</b>	Project seminar	2 SWS	15 CP

At least 26 SWS/39 CPs are elective courses. These must be selected from the "Advanced Mathematics", "Physics in Applications" and "Computer-based Methods" groups, assuming that the content has not already been covered by the Bachelor degree program on "Mathematical Modeling" (for details see examination regulations §7)

## Can I take course X before course Y?

You can take the courses in any order you like. But keep in mind that our recommended timetable arranges the modules in a way that they build upon each other and support your learning process. Moreover, some modules (e.g. Numerics for Partial Differential Equations) have prerequisites for participation (e.g. Applied Differential Equations) and typically Optimization 2 requires Optimization 1.

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## Is it compulsory for MMSO students to at least take one "Special Topic in Mathematics or Applied Mathematics"?

In general, there are three „container modules“, i.e.

- 1) special topics of math
- 2) special topics of applied math
- 3) specialization in math

during each semester we try to give at least two lectures from those topics. You are allowed to take **AT MOST** one lecture from each container, but you **DO NOT HAVE TO** take any of them.

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## I want to do an internship in a company. Is there any way I can get ECTS credits for it in my Master program?

You can do your project seminar with a company. Our master programme does not give credits for internships. If you want to link your work in a company with your academic studies, we suggest writing your Master thesis about it. But keep in mind that a thesis requires a scientific research question and can not be about implementation only.

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## I am attending a summer school/ taking a course at another university. Can I transfer the credits to the MMSO program?

Yes, it is possible to transfer credit points. Nevertheless, you must contact the exam office beforehand and provide a detailed course description (number of credit points, contents). Only then can we estimate if and to which MMSO course the credit points can be transferred.

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## What if I completed more elective modules than required in a certain module group?

Your credit points for electives will sum up (in the order you have successfully completed them → “first come, first count”) until you reached the limit of 120 credit in KLIPS. If you have done more electives than you must have done, they will appear in your final transcript of records but won't influence your final grade.

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## What happens if I have got more than 120 credits?

It is possible that you will get more than 120 credits due to the issues described above. You can have a maximum of 123 credit points. Additional elective courses will appear on your final transcript of records but won't influence your final grade.

## Module Exams and Course Achievements

### How does the German Grading System look like?

The University of Koblenz-Landau uses the 5 point grading system:

**1 to 1.5 – Very good.** You have successfully completed a major part of your exam, but there are some minor areas you must improve.

**1.6 to 2.5 – Good.** You have shown decent academic performance by correctly completing a considerable proportion of your exam.

**2.6 to 3.5 – Satisfactory.** Your performance was a bit more than sufficient and you need to work in several areas.

**3.6 to 4.0 – Sufficient.** You have reached the minimum score to pass the exam, but your performance leaves much to desire.

**4.1 to 5 – Fail.** Your performance lies behind the minimum score.

Please be aware that the whole range of grades is used at the University of Koblenz-Landau. If you want to convert your grades from your home country please visit:

<https://www.tum.de/en/studies/application/grade-conversion-formula-for-grades-earned-outside-germany/>

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### Which are the requirements for awarding of credit points?

You regularly have to participate in all courses of a module if these courses are seminars, practical trainings or exercises. Full participation can still be certified if a student fails to attend up to two single courses but up to a maximum of four-course hours in one semester. Exceptions are only permitted in justified individual cases.

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### Which methods will be used to assess my performance?

You will be deemed to have successfully participated in a course if your performance is considered at least sufficient or your performance has gained you the mark "passed" (4.0). Several methods may be used to assess performance, primarily written examinations, oral examinations, portfolios (laboratory notebook and, if applicable, other documents, e.g. articles, plots, papers), seminar talks, colloquia, reports, practical exercises and term papers. You will be informed of the nature and duration of the methods to be used to assess performance by the start of the course at the latest.

## **I registered for a course, but I do not want to do it anymore. Do I have to complete it anyway?**

You can withdraw from any examination within a given time after you registered. These withdrawal periods differ between courses and can be reviewed in KLIPS.

If you miss the withdrawal period for compulsory **and** elective modules, you must take one of the exams that are offered in the given semester. Keep in mind that if you have missed the withdrawal period and don't take the exam, it will count as "failed"!

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## **Do I have to complete assignments to be able to register for the exams?**

Not in general. If there are any exceptions, your lecturer will let you know at the beginning of term.

## **I registered for a course, but only to attend the lecture. Do I have to take the exam too?**

If you are still registered after the withdrawal period, you will have to take the exam. If you have registered for both (course and exam) and have missed the withdrawal period, you will have to take the exam too.

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## **Can I take the course now and do the exam in a later semester without attending the lecture again?**

Technically, that is possible, but we strongly advise against it. Many course contents are updated to the current state of the art on a regular basis. Therefore, you should always attend the complete course – even if you already did in an earlier semester.

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## **I am sick. Do I have to take the exam?**

No, but you will need to inform the exam office beforehand if you are not able to take the exam and you have to provide a sick certificate from your doctor.

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## **Can you give me a confirmation letter for a passed exam?**

No. All examination results are entered in KLIPS only. The exam office can give you a transcript of records.

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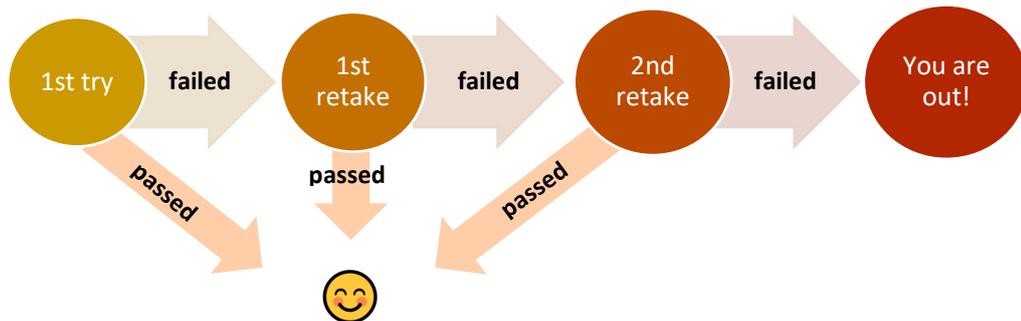
## **Can I retake an already passed exam to improve my grade?**

No, see §19(3) of the examination regulations.

## Retakes and Failed Exams

### I failed an exam. How many retakes will I be able to take and how is the process going to be?

A module examination not evaluated at least as "sufficient" (4.0) can be retaken twice. If you are not awarded a grade of at least "sufficient" for the second retake, you will have definitively failed the module examination and will no longer be able to successfully complete the full Master's degree program. You DO NOT have a third retake!



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### Is there a special regulation for the failure and retakes of elective modules?

If you have registered for an elective module and failed the exam, it is possible to “ignore” this elective BEFORE you have failed it three times. This is only possible once and with elective modules.

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### When will the retakes take place? Do you offer them every semester?

The first and, if applicable, the second retake must take place within 12 months of the date of the first failed module examination. You have to register for every retake separately in KLIPS. In general, the retake will take place in the semester after your failed exam.

## Good scientific practice

### Where can I find hints and tips on academic writing and presentations?

[Here you can find Matthias Thimm's guidelines for seminar presentations and technical reports.](#) (from WeST website).

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### Do you offer workshops on academic writing?

Yes, we do, and we strongly recommend to take them. There is a course called "Scientific English" which can be found in KLIPS. You have to register for the course.

## Plagiarism and cheating

### What is plagiarism?

Plagiarism is "an act or instance of using or closely imitating the language and thoughts of another author without authorization and the representation of that author's work as one's own, as by not crediting the original author" ([dictionary.com](#)).

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### Can I discuss home assignments with fellow students or will that be counted as plagiarism?

You are allowed to discuss home assignments with colleagues, but you are not allowed to jointly work on the assignments or copy solutions. If you hand in assignments in groups, please mention all names of the participants.

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### What are the consequences of plagiarism and cheating?

Dishonesty (cheating, plagiarism) is a major academic offence and will have major consequences. Cheating or plagiarising will result in failing the exam, assignments or thesis. In severe cases, students can be banned from all further exams in that course (which can even result in a ban from the whole programme).

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### I plagiarised just one of my home assignments. Does this mean I cannot complete the entire course?

Correct.

## Master Thesis

### Workload, Credit Points and Final Oral Examination

Please be aware that you will need approximately one semester (6 months) for your Master thesis. We recommend not to take any additional courses or working in other jobs due to the high workload.

You should talk about the length of your Master thesis with your first examiner. As a rough guideline, a Master thesis is about 60-80 pages long.

Your Master thesis will be awarded 27 + 3 credit points (27 CP for written Master thesis; 3 CP for oral exam) (810 hours) which is equivalent to 24 weeks. At a candidate's request, the examination committee can extend once with the consent of the supervisor in justified exceptional cases. For an extension by one month your supervisor has to inform the head of the examination committee ([goetz@uni-koblenz.de](mailto:goetz@uni-koblenz.de)) and the examination office ([hochschulpramt@uni-koblenz.de](mailto:hochschulpramt@uni-koblenz.de)) including the old and new submission dates as well as the reason for the extension.

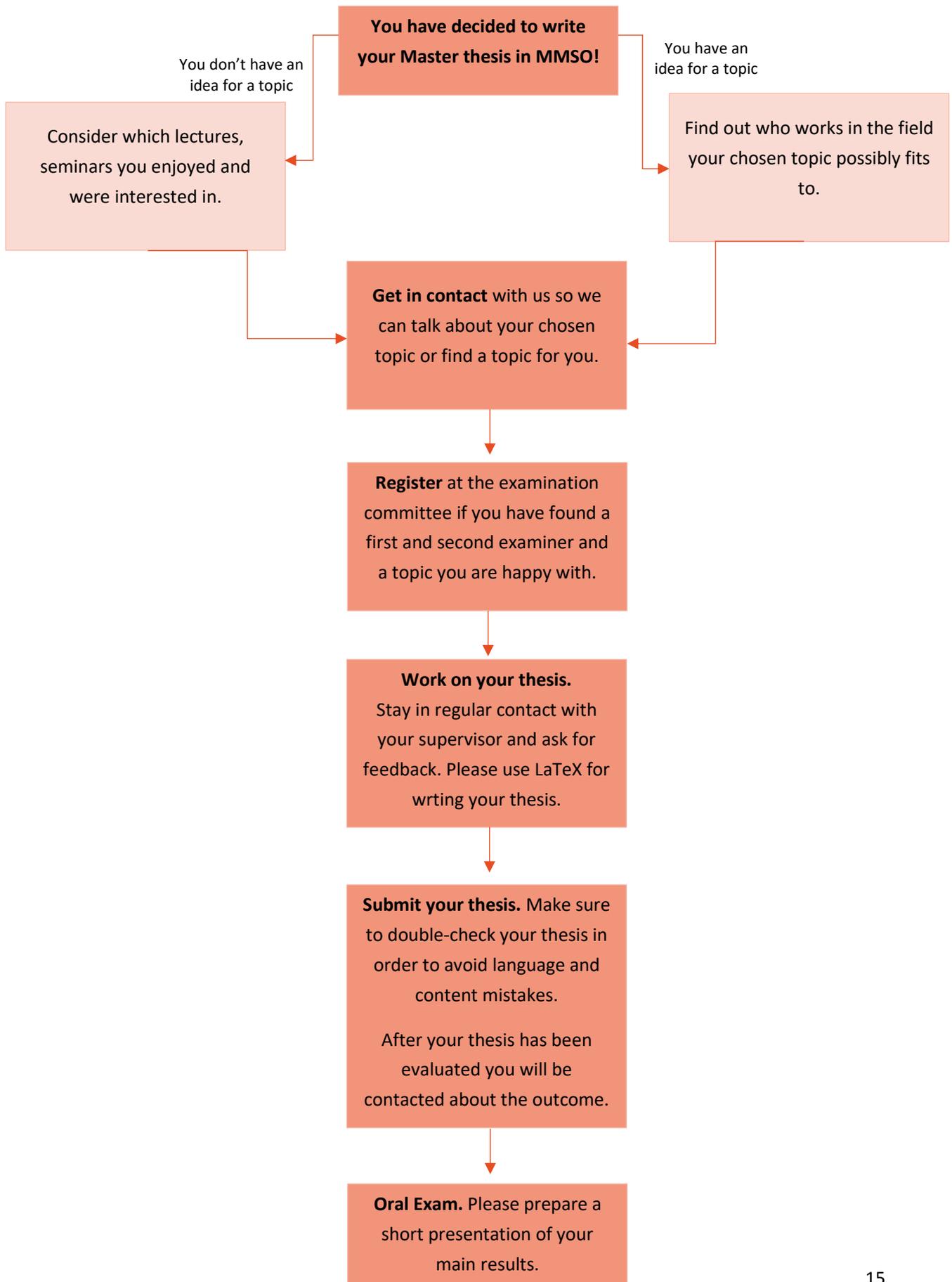
The final oral examination should be held within four weeks of the date of submission of the Master thesis. The chairperson of the examination committee shall set a date for the final oral examination and notify you of this date two weeks beforehand at the latest. Three credit points are awarded for the final oral examination.

### Supervisor(s) of your Master Thesis

You will be supervised by an examiner when preparing your thesis. The supervisor will provide you with guidance during your thesis preparation and regularly enquire about the progress of the work. The thesis is generally assessed by two persons in the form of written evaluations. One evaluation is prepared by the supervisor. The second examiner is appointed by the chairperson of the examination committee. One of the examiners must be a professor from Faculty 3: Mathematics and Sciences or Faculty 4: Computer Science.

It is also possible to be supervised by a member of a company. However, it is crucial to be in mutual exchange with the university. Please contact the head of the examination committee for further information.

## Procedure of your master thesis



## Guideline for your master thesis

### **Step 1: Decide to Write your Master Thesis and Contact Us**

*8 weeks before the official registration at the examination committee*

You have decided to write your Master thesis with us. There several options now. If you have already an idea about a topic of your thesis, look up which lecturers work in the field of your interest. If you haven't decided yet, you can contact a lecturer whose seminars, lectures or working field you are interested in. It is possible to write your Master thesis with a company. In that case please get in contact with the head of the examination committee to talk about your possibilities.

### **Step 2: Register at the Examination Committee**

You and your examiners agree on a chosen topic and the official time phase of 24 weeks to work on your thesis begins. You may register for the Master thesis after completion of the third semester, but you must register within six weeks of delivering all the evidence of course achievements (= 90 credit points). Otherwise, the Master thesis shall be deemed to have been failed at the first attempt.

### **Step 3: Working on Your Thesis**

*6 months before the official submission*

Plan in enough time to critically and thoroughly elaborate your models' analysis, simulations'/experiments' evaluation and interpretation according to your topic. You should meet with your examiner at least every two weeks so he/she can provide feedback on your work and progress. If you need an extension of time, you should talk to your examiner and the head of the examination committee. In justified exceptional cases (e.g. illness) you can get an extension by up to one month. A sick certificate should be submitted.

### **Step 4: Check your Thesis**

*2 weeks before the official submission*

Check your paper on formal requirements, plagiarism (cite all used references and literature), correctness and fluency of language. You have to write academic and not colloquial! We recommend to use LaTeX and not Word or similar programmes.

### **Step 5: Submit your Thesis**

You will have to submit three bound versions of the thesis and one electronic version to the examination committee by the specified deadline. You must also submit a written statement that you are solely responsible for the thesis and used no sources and aids other than those stated.

### **Step 6: Oral Exam**

*Max. 4 weeks after the official submission*

The final oral examination should be held within four weeks of the date of submission of the Master thesis. The chairperson of the examination committee shall set a date for the final oral examination and notify you of this date two weeks beforehand at the latest. Three credit points are awarded for the final oral examination. Prepare a short presentation of your main results.

## I have my own idea for a master thesis. Can I write my master thesis about that?

If you have an idea, contact the profs to find a supervisor. If you find somebody who is willing to supervise you proposed topic, you are fine.

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## When will I be able to start with my Master's thesis?

Candidates can generally register for the Master's thesis after completion of the third semester but **must register within six weeks of delivering all the evidence of course achievements** (meaning when you have achieved the 90 credits). Otherwise, the Master's thesis shall be deemed to have been failed at the first attempt.

Applicants will be entitled to submit a Master's thesis if they

1. Have acquired at least 60 CPs; and
  2. Have agreed on a provisional topic for the Master's thesis with their supervisor.
- 

## What do I have to do if I want to write a thesis in MMSO?

The application for authorization to submit a thesis is to be submitted to the examination committee in writing (e.g. by email). The application should be accompanied by

1. Evidence that the credit points have been acquired; and
  2. The suggested topic for the thesis as approved by the proposed supervisor.
- 

## Can I write my Master thesis together with another student as a joint work?

No this is not possible in MMSO.

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## Can I write my thesis in English or German?

The Master's thesis must be written in English.

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## I heard that I will have to submit a German abstract of my thesis. Is that true?

No, you don't have to write a German abstract. Everything has to be written in English.

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## Can I submit my thesis before the deadline?

Of course. But you should check with your advisor first to ensure your thesis is of high quality, despite the reduced time.

## **My master thesis was graded insufficient and I failed. Can I try again?**

A failed thesis can be repeated once. The examination committee shall ensure that the candidate receives a new topic for a thesis within six weeks from notification of the grade. It is not permitted to repeat the thesis a second time.

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## **I want to submit my master thesis as a paper to a conference; what should I do?**

Talk to your supervisor. He/she can tell your chances of publishing your material at a conference and give you advice for improvements.

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## **I have just submitted my thesis (the only remaining examination), but my future employer needs confirmation that I passed the Master program now. What can I do?**

Ask both of your supervisors to send a brief note to the examination office (hochschulpramt@uni-koblenz.de) confirming that you passed the thesis with at least grade 4.0, but the final grading is still in progress. Then ask the examination office for a preliminary confirmation that you successfully passed the Master program.

# Guidance and Counselling

## **Academic issues**

Questions related to the curriculum, examination, course requirements, professional knowledge: Dr. Robert Rockenfeller, Dr. Christian Kahle and Prof. Thomas Götz.

## **Non-academic issues**

Questions related to the visa, health insurance, accommodation, orientation days, buddy-program, social and cultural events, German labour market: Ines Tobis.

## **Waiting for the admission letter?**

Always include your uni-assist application number and full name in your e-mail. Usually, successful applicants will be notified by the University's Registrar's Office 2 weeks after uni-assist has sent the documents to the university, not before. Due to the high working load during admission periods (Dec–Feb, Jun–Aug), rejected applicants will be notified later. Anna Reisenauer.