UNIVERSITY
OF COLOGNE

WELCOME TO THE MSC IN PHYSICS PROGRAM AT UOC

Summer semester 2025

Foto: Gregor Hübl

Department of Physics / BCGS / Dr. Petra Neubauer-Guenther

03.04.2025

Introduction to the MSc program - Outline

- BCGS
- Some characteristics of the study program
- A guided tour
- Recommendations
- Administrative issues

BCGS

Bonn- Cologne Graduate School of Physics and Astronomy

Bonn-Cologne Graduate School of Physics and Astronomy

- The Bonn- Cologne Graduate School for Physics and Astronomy (BCGS) is a joint program of graduate studies (MSc and PhD) between the universities of Bonn and Cologne.
- All Master and PhD students in Bonn and Cologne are members (unless you opt out).
- You may attend courses in Bonn!

Further queries: gradschool.physics@uni- koeln.de

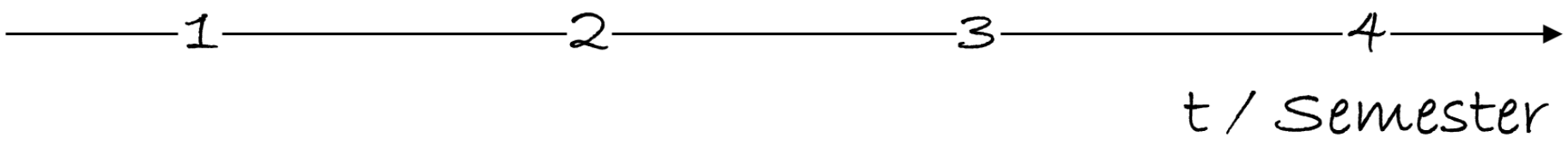
Some characteristics of our MSc in Physics program

What makes the program different from others/from what you are used to?

- Many (!) choices & broad choice of topics
- Few and mostly oral examinations
- Research orientation

→ Freedom and complexity!

A guided tour



Practical Training I – 6 CP Lab Course I	Practical Training II – 9 CP Lab Course II + Adv. Seminar		
Advanced Theoretical Physics – 9 CP or Advanced Theoretical Physics – 9 CP		Introductory Project I 12 CP	Master Thesis 30 CP
Secondary Area of Specialization – 12 CP			
Primary Area of Specialization – 18 CP		Introductory Project II 12 CP	
Elective Area – 12 CP			

A guided tour – the modules

- Advanced Theoretical Physics (9 CP)
- Practical Trainings 1&2 (6 + 9 CP)
- Areas of Specialization (18 CP / 12 CP)
- Elective Area (12 CP)
- Introductory Projects and Research Module (54 CP)

∑: 120 CP

A guided tour – broad choice of topics

Three “mandatory” modules:

But: even mandatory modules come with choices!

- *Advanced Theoretical Physics*: Advanced Quantum Mechanics or Advanced Statistical Physics
- *Practical Training I&II:* **6** lab courses and many seminars to choose from (about **4-5** per term)

Specialization part:

- **8** Primary Areas of Specialization
- Collaboration with **Bonn enhances choice** of possible topics -> **15** Secondary Areas of Specialization
- Elective Area: offers from the faculty (Chemistry, Maths, Geophysics, ..). **plus all 15** Secondary Areas of Specialization!
- For the sake of completeness: special Electives may be chosen, if *approved beforehand* by the examination board

A guided tour – broad choice of topics

Stay tuned for advice what to choose when and how to decide for areas/courses

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A guided tour – few and mostly oral examinations

- Written exam for the theory course
  (Adv. Statistical Physics or Adv. Quantum Mechanics)
- Oral exam for the Primary Area of Specialization (usually 2-4 lectures), max. 45 min.
- Oral exam for the Secondary Area of Specialization (usually 2-3 lectures), max. 45 min.
- Two oral exams for the Lab Courses (Practical Training) 1&2, of max. 45 min. each
- Scientific presentation in the scope of the seminar (not graded)

A guided tour – few and mostly oral examinations

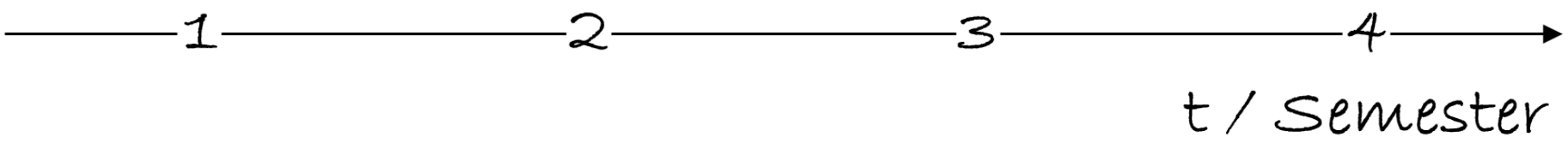
According to the examination regulations:

- Exams you did not pass can be repeated! (means: # attempts for an exam = ∞)
- Except for the Master Thesis!

- Oral or written exam(s) for the Elective, depending on your choice

- All courses outside our Physics Department:
  rules of the organizing institution apply for examinations (includes Bonn!)

A guided tour



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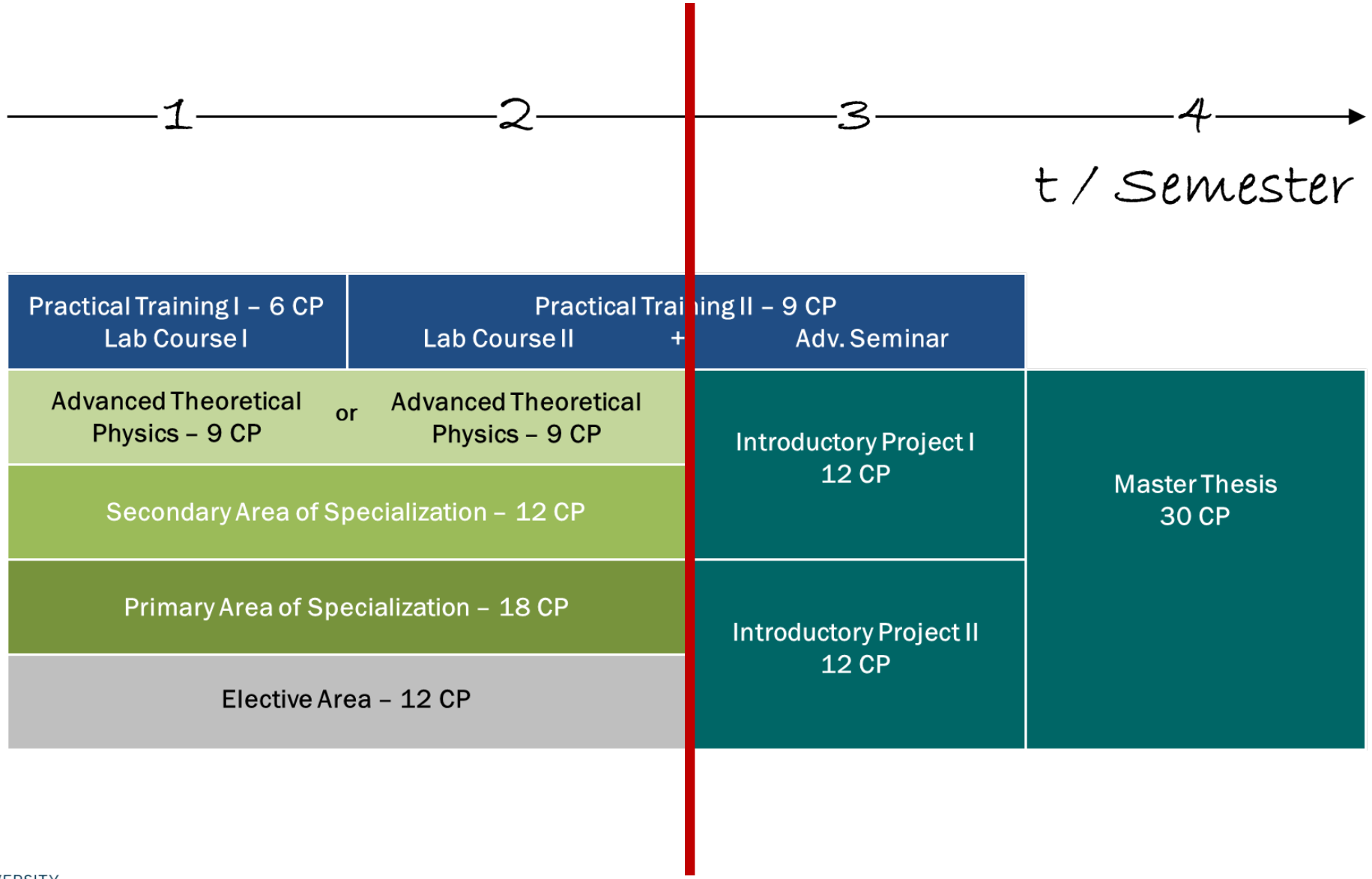
Primary Area of Specialization – 18 CP		Introductory Project II 12 CP	
Elective Area – 12 CP			

A guided tour – research orientation

- To prepare: Research Internships can replace a specialized course in the Primary Area of Specialization. (= getting CP for the internship)
- Master Project usually corresponds to the Primary Area of Specialization – but not necessarily!
- Introductory Projects and Master Project are one topical unit and correspond to a one year's work in the lab or on a theory project.
- Note: to start Introductory Project 1all exams have to be done.

A guided tour



A guided tour – research orientation

- To help setting up the research phase → Research Internships
  Can replace a Specialized Course in the Primary Area of Specialization, i.e. one can get CP for the Internship.
- Master Project usually corresponds to the Primary Area of Specialization – but not necessarily!
- Introductory Projects and Master Project are one topical unit and correspond to a one year's work in the lab or on a theory project.
- Note: to start Introductory Project 1all exams have to be done.
- Inform yourself early about the different research groups (websites, talk to lecturers & fellow students, Research Internship, etc.).
- If you know what you want, you may ask early for a Masters Research Project (**but don't start early!**)

A guided tour – freedom and complexity

- Even mandatory parts come with choices.
- Many choices need many decisions – you have to make these decisions!
- You may fully tune the Areas of Specialization and the Elective Area according to your interests. But: not all preferred LECTURES of your choice might be offered during your studies!
- You need to consider also courses which will be offered in the following semester(s).
- Scheduling your oral exams is your responsibility!

→ https://physik.uni-koeln.de/studium/studium/master-of-science/curriculum-courses

A guided tour – freedom and complexity

Field	Primary Area at least 18 CPs Courses you have to account for:	Secondary Area at least 12 CPs Courses you have to account for:	Associated Courses Cologne Aachen Bonn
Astrophysics	▪ Core Course Advanced Astrophysics ▪ sufficient Specialized Courses	▪ Core Course Advanced Astrophysics ▪ sufficient Specialized Course	Current Course Offerings long-term planning
Condensed Matter Physics	▪ Core Courses Condensed Matter I & II ▪ 2 Specialized Courses (one of them may come from the Field Solid State Theory)	▪ Core Course Condensed Matter I ▪ Core Course Condensed Matter II or 2 Specialized Courses	Current Course Offerings long-term planning
Foundations of Quantum Technologies: Matter, Light and Information	▪ 2 Core Courses ▪ sufficient Specialized Courses	▪ Core Course ▪ further Core Courses or sufficient Specialized Courses	Cologne Course Offerings Bonn Course Offerings Aachen Course Offerings long-term planning (coming soon)

https://physik.uni-koeln.de/?id=856

Primary and Secondary AoS Condensed Matter Physics (ConMat)

Coordination: J. Hemberger — last update: 15.03.2025

	hpw	CP	SS25	WS 25/26	SS26	WS 26/27	SS27	WS 27/28
Core Courses								
Condensed Matter Physics I	3+1	6		x		x		x
Condensed Matter Physics II	3+1	6	x		x		x	
Spezialized courses								
Superconductivity	2	3		x		(x)		(x)
Magnetism	2	3	x		x		x	
Experimental Methods in Condensed Matter Physics	2	3		x		x		x
Introduction to Neutron Scattering	2	3						
Optical Spectroscopy	2	3	x					
Physics of Surfaces and Nanostructures	2	3						
Photons and Matter	2	3						
Solid State Spectroscopy	2	3						
Topological Matter (and Quantum Computing)	2	3		x		x		x
Quantum Electronics and Qubits	3+1	6	x		x		x	
2D materials / Correlations in 2D	2	3						
Quantum Nanoscience	2	3						
Solar energy conversion	2	3						
Semiconductor Physics	2	3						
Seminars								
Advanced Seminar	2	3	x		x		x	

x confirmed
(x) planned

Condensed Matter as Primary: Condensed Matter I & II plus specialized courses to sum-up to 18 CP

as Secondary: Condensed Matter I plus Condensed Matter II or specialized lectures to sum-up to 12 CP

Recommendations – what to choose when?

- You already know what courses and areas to choose?

  Fine! Go ahead!

- You are not sure which areas to choose?

  Attend more (core) courses to get an orientation.

  Ask for consulting after 3-4 weeks.

  You should come to a decision on your areas at the end of the first semester.

Recommendations – talk to people

- Talk with module coordinators, get advice
- Talk with the course guidance (P. Neubauer- Guenther, F. Lewen)
- Talk to senior students.
- In case of doubt, talk to the relevant people before you make decisions, not afterwards.
- Report problems!

To book a slot with me:

Administrative issues – KLIPS & ILIAS

Please register in KLIPS2.0 for all lectures/seminars you want to take this semester.
(Note: there is a special system for the lab courses.)

Otherwise you might not get access to the teaching materials in ILIAS.

Note: choice of PAoS/SAoS, Core Courses etc. in the registration part of KLIPS has no impact on your final choice!

How to register?

See: https://physik.uni-koeln.de/fileadmin/Downloads/modulhandbuch/master/Guideline_KLIPS2.pdf

Administrative issues – Courses in Bonn

For now, Bonn courses are accessible via ILIAS (check for offers from partner location).

We arrange “second enrollment certificates” for the University of Bonn for all Cologne students newly enrolled in the MSc providing you with a student account from there. With that information, you can register for the courses in the Bonn system eCampus.

Note: it will take a while before they will be available – at least two weeks, can be longer!

Administrative issues – Bonn/Cologne

University of Cologne	University of Bonn
KLIPS2.0 To register for courses and exams	**BASIS** To register for exams
ILIAS To get access to teaching material	**eCampus** To register for courses and get access to teaching material
Mostly oral exams • Registration only possible when all requirements fulfilled (number of CPs, number of core courses, etc.) • Schedule exams in agreement with respective professor	**Mostly written exams** • Written exams at the end of the lecture time, given time slots • Strict deadlines for exam registrations.

Administrative issues – Labs for Practical Trainings

Make sure to register for the lab course in the respective data base till

- April 8th (biophysics, atomic/molecular physics & particle physics)
- April 10th (condensed matter physics & nuclear physics)

Lab course on computational physics:

- Registration is done via ILIAS
- Deadline April 8th, 18 h
- Number of participants is **limited to 15** (lots will be drawn)

https://physik.uni-koeln.de/studium/studium/master-of-science/curriculum-courses/mandatory-part

Administrative issues – Labs for Practical Trainings

- There will be mandatory briefings for the lab courses on Tuesday, April 15th via zoom @ 14.00 h
- Special briefing for biophysics on Monday, April 14th @ 13.00 h

→ Zoom links will be sent to registered students

- Mandatory meeting for computational physics on April 7th, 16 h (0.01ETP)

for all students who want to register!

Administrative issues – Honors certificate requirements

Bonn-Cologne Graduate School of Physics and Astronomy

- The Master's studies have to be finished within 5 semesters.
  (Exceptions can be granted, if the delay is not caused by the student. Please contact the BCGS office at your university to discuss individual reasons for exceptions.)
- The final mark for the Master's degree must be 15 or better.
- At least 126 ECTS have to be obtained, i.e. 6 ECTS more than necessary for a regular MSc.
- Presentation of a poster (or something equivalent) in a BCGS symposium. This presentation should typically take place towards the end of the research phase.
- Participation in at least one course at the partner university is required.

And finally

Have a good start and enjoy your studies!

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Questions?

Elective Area

ILIAS

Research Phase

BCGS

KLIPS2.0

Registration

eCampus

Core Course

Areas of Specialization

Introductory Projects 1&2

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