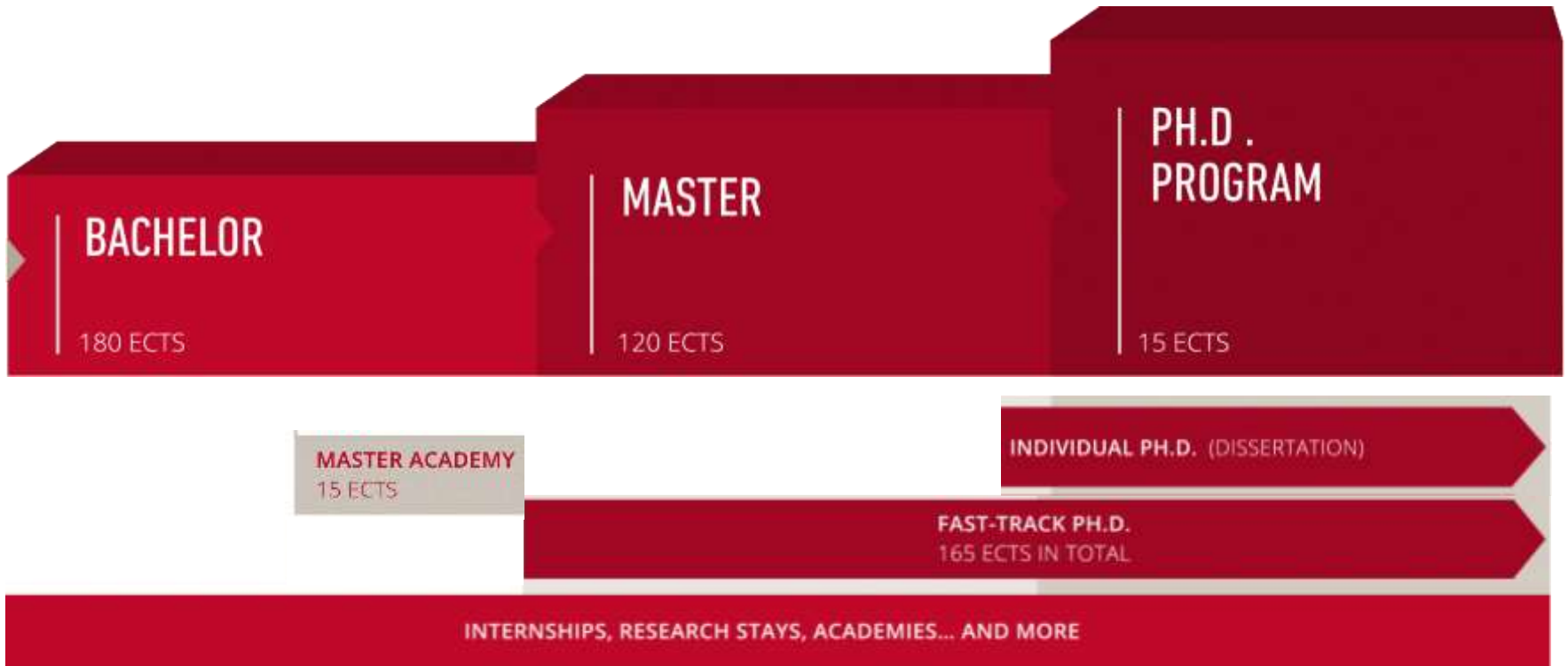


The physics program in Mainz

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The physics program in Mainz

You are here

BACHELOR

180 ECTS

MASTER

120 ECTS

PH.D.
PROGRAM

15 ECTS

MASTER ACADEMY
15 ECTS

INDIVIDUAL PH.D. (DISSERTATION)

FAST-TRACK PH.D.
165 ECTS IN TOTAL

INTERNSHIPS, RESEARCH STAYS, ACADEMIES... AND MORE












The physics program in Mainz

We'll talk about this



Details in module handbook: <https://www.studium.fb08.uni-mainz.de/downloadcenter-physik/>

The Master's program in thumbnails ...

| | | |
|--|--|---|
| <p>ECTS 120 ECTS / 200 CREDIT HOURS </p> | <p>DURATION 4 / 2 SEMESTERS YEARS</p> | <p>DEGREE  MASTER OF SCIENCE IN PHYSICS</p> |
| <p>SEMESTER FEE € 270 </p> <p>NO TUITION FEES FREE REGIONAL TRANSPORTATION TICKET</p> | <p>ADMISSION RESTRICTIONS </p> <p>OPEN ADMISSION</p> | <p>REQUIREMENTS </p> <p>BACHELOR DEGREE AND GRAD POINT AVERAGE B OR BETTER</p> |
| <p>APPLICATION DEADLINES </p> <p>1ST SEPTEMBER 1ST MARCH</p> | <p>LANGUAGE </p> <p>ENGLISH</p> <p>ENGLISH PROFECIENCY REQUIRED</p> | <p>LIVING </p> <p>STUDENT HOUSING GUARANTEE FOR INTERNATIONAL STUDENTS</p> |
| <p>OUR PROFS </p> <p>ONE TO ONE SUPERVISORY RELATIONSHIP FOR EVERY STUDENT</p> | <p>STUDY ABROAD OPTIONS </p> <p>150 JGU UNIVERSITY PARTNERS WORLDWIDE</p> | <p>FEATURES </p> <p>RESEARCH BASED WORK AND STUDY</p> |

Some things that may be different from what you are used to ...

- Physics education in Germany contains experimental, mathematical and theoretical aspects with similar emphasis and avoids early specialization.
- Experimentalists teach „experimental courses“, theorists „theory courses“. Mostly, laboratories are separate modules that are not interweaved with courses.
- All classes are accompanied by 1-2 hour tutorials. Typically, 50% of the homework problems need to be successfully completed. Written or oral exams.
- Advanced laboratory classes or projects are considered to be important and have to be taken by all students.
- While students have to choose a field outside of physics during the Master's, there is a smaller non-physics component than in other countries.
- The one year research phase with substantial scientific contribution is an important ingredient of German Master's programs.
- Finishing the Master's program before the PhD is the „standard“ mode of operation (a fast track PhD following BSc degree is the exception)
- PhD students are considered „qualified researchers“: while special PhD courses are offered, there is no initial „teaching phase“ nor are there intermediate exams.

Some numbers ...

- **1 hour = 45 min!** 12-15 weeks per semester
- *One credit point corresponds to a workload of ~ 30 hours:*
8-9 credit points given for a **4 hour class** including tutorials
- About 30 Master's courses per semester, roughly 25 students per semesters

German grading system

| Grade | Descriptor | Description | US equivalent |
|-------|--------------|------------------------------|---------------|
| 1.0 | very good | outstanding | A |
| 1.3 | | | A |
| 1.7 | | | A- |
| 2.0 | good | substantially above average | A- |
| 2.3 | | | A- |
| 2.7 | | | B+ |
| 3.0 | satisfactory | still meets the requirements | B |
| 3.3 | | | B- |
| 3.7 | sufficient | below requirement | C+ |
| 4.0 | | | C |
| <4.0 | failed | does not meet requirement | |

GPA: ~ 1.8

How to make it into the MSc program

- **Central online application** (but certified copies by mail ...)
- **Deadlines** (*only for physics!*):
 - September 1st (for winter term, mid October to mid February)
 - March 1st (for spring term, mid April to mid/end July)
- Following **recognition** (60 €) and checking of application by admission office, we obtain documents and check if criteria of our regulations are fulfilled
- Requirements on **additional classes** may be imposed (27 CP maximally)
- Good idea to **send me your transcript** before application !

Minimal requirements:

- 30 CP in experimental physics
- 19 CP in laboratory work
- 25 CP in theoretical physics
- 23 CP in advanced mathematics and calculational methods, as well as
- 9 CP for a written Bachelor's thesis (single author)

Structure of the Master's program ...

| 1 SEMESTER | 2 SEMESTER | 3 SEMESTER | 4 SEMESTER |
|--|---|--|---|
| EXPERIMENTAL PHYSICS 6 CP | ADVANCED COURSE 6 CP | METHODOLOGICAL KNOWLEDGE 15 CP | MASTER THESIS 29 CP |
| THEORETICAL PHYSICS 9 CP | LAB WORK Advanced Laboratory 1 & 2 | | |
| TOPICAL COURSE 1 6 CP | TOPICAL COURSE 2 6 CP | SPECIALISATION 15 CP | Colloquium 1 CP |
| SEMINAR 1 4 CP | SEMINAR 2 4 CP | | |
| SUBSIDIARY SUBJECT Introduction to Nuclear Chemistry 4 CP | SUBSIDIARY SUBJECT Nuclear Chemistry Laboratory 5 CP | | |
| 29 CP | 31 CP | 30 CP | 30 CP |
| 120 CP | | | |

Structure fixed, but
*choices can be made
in all modules ...*

All classes in English,
except for many
subsidiary subjects

*may choose another
Physics topic instead*

Want more information?

| | Regular course | Advanced experimental | Advanced theoretical | In depth subjects | Advanced laboratory |
|---|---|---|--|---|--|
| Condensed matter | <i>twice per year</i> Condensed matter physics | <i>once per year each</i> Selected topics in condensed matter physics | <i>once per year each</i> Introduction to theory of condensed matter | <i>~2 courses per year</i> Selected chapters in solid state physics | <i>twice per year</i> 4-8 laboratory experiments, selectable among all areas of specialization |
| | <i>once per year</i> Advanced statistical mechanics | Modern methods of condensed matter physics Materials science | Computer simulations in statistical physics Modern computational methods | Selected chapters on condensed matter theory Theory of soft matter 1 Theory of soft matter 2 | |
| | Quantum optics, atomic and neutron physics | <i>twice per year</i> Advanced quantum mechanics | <i>twice per year</i> New concepts in theor. quantum physics | Quantum information | <i>~1 course per year</i> Photonics 2 |
| <i>2 courses per year</i> Photonics | | | Ion traps and mass spectroscopy | | |
| <i>twice per year (alternating)</i> Atomic physics | | Laser spectroscopy | Advanced quantum computing | Ultra-cold matter | Seminars (2) <i>twice per year</i> student presentations on topical research areas (one of which can be more specialized) |
| | | Precision experiments | | | |
| | | Quantum optics | | | |
| Particle, hadron and astro-particle physics | <i>twice per year</i> Particle and hadron physics | <i>once per year each</i> Statistics, data analysis and simulation Particle detectors Particle physics | <i>once per year each</i> Cosmology and general relativity Symmetries in physics Theoretical particle physics | <i>~2 courses per year</i> Adv. particle physics Adv. subatomic physics Adv. accelerator physics Adv. astroparticle physics | |
| | <i>twice per year</i> Quantum field theory 1 Quantum field theory 2 | Astroparticle physics Accelerator physics | Modern methods in theor. particle physics | 2 courses per year Graduate study courses | |
| | | | | | |
| | | | | | |

| | | | | | | |
|----------------------------------|---------|-----------|-------------|-------------|------------|----------|
| Subsidiary subjects choose among | Biology | Chemistry | Meteorology | Mathematics | Philosophy | Business |
| | | | | | | |

| | | |
|----------------------|-------------------|---------------------|
| Experimental Physics | In-depth subjects | Advanced Laboratory |
| Theoretical Physics | Seminar | Subsidiary Subject |

If anybody is interested in details

What do we mean by seminars?

8 CP

At least two seminars on different research fields scheduled in each semester:

- Every Master's student has to give 30-45 min talk on a contemporary research subjects
- 10-16 talks are given in each seminar that are followed by a discussion among students
- Grade depends both on scientific quality (depth, correctness, response to questions ..) and quality of presentation (structure, clarity, presentation style, graphics ...)

Examples for seminar topics (for particle and nuclear physics):

- Gravitational waves: principle and discovery (experimental)
- Silicon pixel detectors (technical)
- Additional spacetime dimensions (theoretical)

similar examples also in quantum physics and solid state physics

What do we mean by laboratory ?

10 CP

- Two parts with up to **10 laboratory days** in total, about two days per experiment
- Emphasis on **independent work**
- Second part can be replaced by a **project** in a research group (may be theoretical)
- Two-student teams work on challenging experiments, supervised by assistants
- Typically complex data acquisition systems/computer-based analyses used

- Graded based on detailed **written summary reports**

What is a subsidiary subject?

9-15 CP

Choose from either:

- Chemistry 2 options
- Computer Science 4 options
- Mathematics 26 options
- Meteorology 4 options
- Economics 3 options
- History of Natural Sciences 2 options
- Philosophy 3 options
- + interdisciplinary class (research visit, language class, history, ... 3 CP)

Unfortunately,
only meteorology and some economics options guaranteed in English
→ may choose classes from our physics portfolio instead

What is the research phase?

60 CP

We host about 60 research group, but experimental and theoretical, in the Institutes of Physics and Nuclear Physics:

- Quantum and Atomic Physics
- Hadron and Nuclear Physics
- Particle and Astroparticle Physics
- Condensed Matter Physics

Associated are:

- PRISMA Cluster of Excellence, MAINZ Graduate School
- MAMI Accelerator and TRIGA Research Reactor
- Max Planck Institutes for Chemistry and for Polymer Science
- Helmholtz Institute (HIM)
- Institute for Molecular Biology (IMB)

You will hear much more about the research programs here I will concentrate on the „teaching aspects“ ...

... research phase

Once you have taken all classes or there is only one class to go, you may enter the continuous research phase of **1 year**:






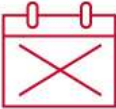


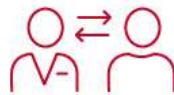


- Specialization 15 CP
- Methodological knowledge 15 CP
- Master's thesis 30 CP

Before choosing a subject:

- Test your interests by looking for a paid student job in a research group first!
- Knock at many doors! (You will be **very** welcome!)
- (There is a BSc class, where research groups present themselves/themes)

... and then comes the PhD

~ 60%

| | | |
|--|--|---|
| <p>ECA</p>  <p>GRADUATE SCHOOLS OFFERING EXTRA CURRICULAR ACTIVITIES AND NETWORKING</p> | <p>DURATION</p> <p>SEMESTERS 6 / 3 YEARS</p> | <p>DEGREE</p>  <p>DR. RER. NAT.</p> |
| <p>SEMESTER FEE</p>  <p>NO TUITION FEES FREE REGIONAL TRANSPORTATION TICKET</p> | <p>FINANCE</p>  <p>MONTHLY SALARY</p> | <p>REQUIREMENTS</p>  <p>MASTERS OR BACHELOR DEGREE WITH GRAD POINT AVERAGE B OR BETTER</p> |
| <p>APPLICATION DEADLINES</p>  <p>NO DEADLINE, APPLICATION ANYTIME</p> | <p>LANGUAGE</p>  <p>ENGLISH</p> <p>ENGLISH PROFECIENCY REQUIRED</p> | <p>LIVING</p>  <p>HOUSING OPPORTUNITIES AVAILABLE</p> |
| <p>OUR PROFS</p>  <p>INDIVIDUAL SUPERVISION</p> | <p>STUDY ABROAD OPTIONS</p>  <p>150 JGU UNIVERSITY PARTNERS WORLDWIDE</p> | <p>FEATURES</p>  <p>INTERNATIONAL EXPERIENCE THROUGH RESEARCH STAYS ABROAD</p> |

Any questions? Discussion points?



Christian Schmitt
Manager of Studies



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Examinations Office

International Office of our Department

studies.fb08.uni-mainz.de/international-students-incoming/

