Studying for the Master of Physics in Bonn

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Contents

Welcome to Bonn!

A Brief History of Bonn

- Settled since stone age (Oldest grave including a dog in Oberkassel, ca. $12,000$ BC)
- Name "Bonn" probably of Celtic origin (pre–Germanic, 1^{st} millenium BC)
- Ca. 11 BC: Romans build first permanent fortification (part of "limes" along the Rhine)
- Civilian settlement "Vicus Bonnensis" from ca. 50 AD
- 5^{th} century AD: Franks expulse Romans from Bonn (and rest of Rhineland)
- 882 to 991: Vikings loot and burn Bonn thrice

History (cont'd)

- 11^{th} century: begin of construction of "Münster"; Bonn belongs to archbishopry of Cologne.
- 1597: Bonn becomes capital of said archbishopry
- 1587, 1684, 1703: Bonn is besieged/cannonaded/occupied/looted
- 18^{th} century: Construction of palaces (main one later becomes main building of university; lesser one in botanical garden)
- December 16 (?), 1770: Ludwig van Beethoven born in Bonn. (You can visit his birth place downtown!)
- 1793 to 1814: French occupation. (Carneval uniforms stem from that time.) Afterwards Bonn becomes part of Prussia.

History (cont'd)

- 1818: (2^{nd}, final) foundation of Bonn university.
- 1869 to 1888: Rudolf Clausius, discoveror of entropy, prof. in Bonn
- 1889 to 1894: Heinrich Hertz, discoverer of electromagnetic waves, prof. in Bonn
- December 13, 1920: Haribo founded in Bonn
- 1929 to 1932: Construction of first "Autobahn" between Bonn and Cologne A555, still exists.
- 1949 to 1994: Bonn is capital of (West) Germany. (Since then: "federal city")

Present: Bonn Now

- $330,000$ inhabitants, (rank 19 in Germany) incl. $30,000$ university students
- Area $140\ \mathrm{km}^2$, along the Rhine
- 6 major museums (plus many small ones)
- 3 big cinemas, with 17 screens
- Numerous clubs and pubs
- Several big parks and green areas

Your Future: Master of (Astro-)Physics in Bonn

As soon as possible, you need to:

- Enroll as student of Bonn university! ($\rightarrow$ BCGS) This gets you a student number ($\rightarrow$ "free" public transport, lower prices in Mensa) and a university (computer) account
- Apply for "Admission to Master in (Astro-)Physics Examinations"; application form is available here, and online. This gets your Basis account started (online exam administration tool).
- Also, at some point register on eCampus for the courses you might want to take, see `https://ecampus.uni-bonn.de`; useful for communication with profs, organizing tutorials, etc.

Structure of the Master Courses

- Run over 2 years (nominally), 120 Credit Points (CP)
- 1^{st} year, 60 CP: Course phase: Lectures, lab course, (at least) one student seminar; each of these is one "module"
- 2^{nd} year, 60 CP: Research phase, essentially working on your Master thesis. (For legal reasons, this is broken up into 3 modules, with $15 + 15 + 30$ CP.)
- You need to complete the 60 CP of the course phase before you can start the research phase!

Master of Physics (Course Phase)

- Mandatory “base modules”:
  - Advanced Lab course (physics600, 7 CP)
  - Lecture Theoretical Physics (physics605, 7 CP)
- “Specialization” Modules: 24 CP from catalogue of “physics600” courses. (Currently 22 choices in Bonn.)
- “Elective Advanced” Modules: 18 CP from catalogue of “physics700” courses. (Currently 97 choices in Bonn.)
- Student Seminar: 4 CP
- Warning: courses registered as “Additional Voluntary” in Basis will *not* count towards your 60 CP!

Base Module 1: Advanced Lab Course

- Can be taken in winter term or summer term
- See next talk

Further information:

https://www.physik-astro.uni-bonn.de/praktika/en/

p601@physik.uni-bonn.de

Base Module 2: Lecture Theoretical Physics

- By default: Advanced Quantum Theory (AQT), physics606. (Path integral, time–dependent perturbation theory, scattering theory, second quantization, relativistic QM). Only taught in winter term.
- Only if you already successfully took an equivalent class: Choose one of:
  Winter term: Group Theory (751), Computational Physics (760), Advanced QFT (7501)
  Summer term: QFT (755), GR and Cosmology (754)
- Equivalence needs to be certified by me!

Specialization Modules

- Introduce you to one of the main physics research areas of Bonn university:
  - Elementary Particle and Hadron/Nuclear Physics: experimental: physics611, 612, 618, 632, 633, 639; theoretical: physics615, 616, 636, 637, 755, 7501.
  - Condensed Matter Physics and Photonics: experimental: physics613, 620, 631, 634, 641, 642; theoretical: physics617, 638, 759a/b
  - Typically come in pairs: introduction in winter term, advanced one in summer term
- Lectures taken elsewhere must fit into either of these categories to be counted towards your Specialization courses! Equivalence again needs to be certified by me.

Elective Advanced and Seminar Modules

- Can be chosen from a *large* catalogue,, see

  `https://web3.physik.uni-bonn.de/mhb/ausgabe.php?stg=MSPHYSIK2`

- Warning: not all courses are offered each semester; for up–to–date list of next semester, see `https://www.basis.uni-bonn.de`, or eCampus.
- *One* (BCGS) "research internship" can count for 4 CP in Elective Advanced; *one* (BCGS) "intensive week" can count for 3 CP in this category. Alternatively: *two* research internships (8 CP), but then *no* intensive week.
- *One* Specialization module (from a specific list) can instead be chosen as Elective Advanced.

Lectures: Generalities

- Time unit for lectures: “academic hour” of 45 minutes
- Lectures start 15 minutes past the hour (“c.t.”)
- A double lecture (90 minutes) may or may not include a 15 minute break in the middle
- You need not be present during lectures, but you do have to learn their content. You should be present during seminar talks.
- No. of credit points (CP) scales with length of lectures; e.g. $3+2$ weekly hours (SWS): 7 CP; $3+1$ SWS: 6 CP; $2+0$ SWS: 3 CP.
- Towards the end of term, you’ll be asked to evaluate the lecture(r) and your tutor(ial).

Exams

- Every module has a separate final exam; can be written or oral, as stipulated in the module handbook. Modalities are determined by the prof giving the lecture.
- For (almost?) all lectures: You need to solve at least 50% of the homework problems in order to be admitted to the final exam!
- Grading scheme:
  1.0: top grade;
  1.3, 1.7, 2.0, . . . , 3.7: passing grades
  4.0: lowest passing grade;
  5.0: failed
- Be careful to click on the correct category (Specialization, Elective Advanced, Additional Voluntary) when registering an exam in Basis!

Exams: Registration

- You need to register for each module exam in Basis! Deadline for winter term lectures in mid–January. This is *your* responsibility; without registration you cannot participate!
  - After registration you automatically receive a confirmation e–mail; please keep it as proof of registration
  - *Actively* check your registration for this exam under “Info über angemeldete Prüfungen” – it should appear there!
  - If an attempted registration leads to an error message: contact the exam office *right away*! `pa@physik.uni-bonn.de` or `haubrich@iap.uni-bonn.de`. The exact wording of the error message, or a screen shot, is helpful for trouble shooting!
  - Seminars have much earlier registration deadlines, since your talk there counts as exam.

Exams (cont.'d)

- Each lecture module offers the final exam *twice*!
  - If you registered for the (first) exam but didn't show up, or failed, you're automatically registered for the second exam.
  - If you passed the first exam, you can still take the second one in order to improve your grade. In this case you need to register for it! The better grade will then count.
- You can withdraw your registration until the evening before the date of the exam. It saves some trees!
- You failed a module only if you failed *both* exams in a given semester! (Or didn't show up.) This counts as *one* failed attempt.

Exams (cont.'d)

- There is *no third exam date* in a given semester. This is in order to ensure equal treatment of all students.
- Single exception: you're studying abroad ($\rightarrow$ Erasmus) during the date of the exam: Once only!
- If you fail a given module three times (i.e. were unsuccessful in 6 exams) you will be exmatriculated.
- You are not forced to take the same module again, as long as you satisfy all the criteria for the course phase.
- Hence you *have to pass* AQT (or its substitute) and the advanced lab!
- The Master of Astrophysics has 5 compulsory lecture modules! For further details: talk by Prof. Schneider.

Research Phase

- The topic of the thesis needs to be approved by the exam board *before* you start the research phase! This determines the deadline by which you have to hand in the thesis.
- Phase consists of three modules, for legal reasons; hence you get three separate grades.
- The thesis, but not the preparatory modules, needs to be graded by two different profs. If, and only if, the thesis work is done in Bonn, the second referee can be found well after starting the research phase.
- Before you hand in the thesis, you have to give a thesis colloquium talk. (It is not graded.)

Research Phase (cont.'d)

- The research phase can start any time, as soon as you have fulfilled all the requirements.
  ($7 + 7 + 24 + 18 + 4 = 60$ CP!)
- You can "change your mind" about the thesis topic *once*, and only within 8 weeks after its registration
- In the extremely unlikely case that you fail one of the modules of the research phase, you get a second chance, with a different topic.

Modules Done Elsewhere

- We encourage you to take advantage of the courses offered by our BCGS partners in Cologne!
- You may also already have taken courses (roughly) equivalent to some of our modules before coming to Bonn; or you may take some during an “Erasmus” stay abroad.
- In all these cases the equivalence needs to be certified by me! This is basically automatic in case of Cologne. Note: you often need to arrange a special (oral) exam for modules taken in Cologne.
- If you want to do your research phase elsewhere, including in Cologne, you need to specify a second, Bonn, supervisor already when registring the topic with the examination board!

In Case of Questions

- Try to clear up physics questions as quickly as possible!
  - Ask the prof during class, or during the break. We are grateful for questions!
  - Alternatively, ask your tutor.
- You can / have to choose one or two mentor(s), who can give advice regarding courses etc.
- The BCGS office can assist you with many problems concerning your stay in Bonn.

Words of Wisdom

- Do your homework!
- It's quite difficult to catch up if you fall far behind, so try not to!
- When registering courses in Basis, be sure to register them for the correct category! (E.g. Specialization, Elective Advanced, Additional Voluntary Course, . . .)
- Our Master course is not easy, but we selected you carefully!

Student Representation

- In German universities, students participate, and vote, in *all* decision making committees! This includes committees deciding on hiring of professors, or on how to spend certain funds, etc.
- Student participation is coordinated by the “Fachschaft”, which represents *all* students of physics and astrophysics. These representatives are elected.
- The “Fachschaft” is very much interested in getting new Master students, including international students, involved!
- It also does things not related to physics (e.g. parties).
- Contact: `fsphysik@uni-bonn.de`,

  `https://www.fs-physik.uni-bonn.de/de/startseite`

In Case of Problems

- For issues with everyday life (health insurance, unexpected bills, . . .): Other students; Fachschaft; BCGS office; mentors
- In case of mobbing, (sexual) harassment etc.:
  Prof. (Mr.) Florian Bernlochner (Phys. Inst.; florian.bernlochner@uni-bonn.de)
  Jun.-Prof. (Ms.) Annika Thiel (HISKP; thiel@hiskp.uni-bonn.de)
  Both were elected by the student body!

Further Information

- Questions regarding which course(s) to take: your mentor, or the study counselor.
  Physics: Prof. Manuel Drees, sb@physik.uni-bonn.de;
  weekly (Zoom) office hour Mo. 4:30 p.m.
  Astrophysics: Prof. Peter Schneider, peter@astro.uni-bonn.de
- To certify equivalence of courses taken elsewhere: study counselor.
- For questions regarding exams: study counselor, or exam office:
  Ms Silke Kleuser: skleuser@uni-bonn.de;
  Prof. Hartmut Schmieden: schmieden@physik.uni-bonn.de
  Sometimes the entire exam board needs to be consulted.
- Many questions are already answered here:

  https://www.physik-astro.uni-bonn.de/en/studying/

If you need help, please contact one of us!