Program Outline International Master

About us

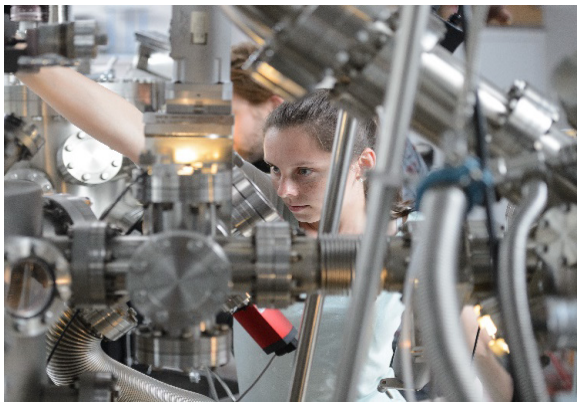
Our faculty offers two research-focused, English language, International Master programs in the field of physics, a general **Physics** program and a more applications oriented **Quantum Engineering** program. The structures of the two programs are similar. They are two-year programs comprised of a mix of hands-on research within internationally active research teams, and specialty lectures designed to support your development as a researcher. Successful completion of either of these programs opens a gateway to both an academic and an industry career. While many of our graduates find a PhD position within our department, others decide to pursue their academic career elsewhere. Recent graduates of our Master programs have gone on to do PhDs in Stanford, Berkeley, Oxford and Cambridge, for example, or joined major international companies in different sectors, such as engineering, energy, healthcare, automobiles, finance and air carriers. In addition to their high quality, our programs are financially accessible, being entirely tuition free. Würzburg has a low cost of living as compared to other European cities.

Research Focus

The 15 chairs (involving 25 professors) at the Faculty of Physics and Astronomy in Würzburg cover a broad range of topics within condensed matter physics, particle and astrophysics, energy research, quantum- and nanooptics, optoelectronics and imaging technologies, combining experimental, theoretical and applied approaches. Publishing on average more than fifty papers in high-impact journals such as Nature, Science and Physical Review Letters per year, and about 200 in more specialized journals, we are among the outstanding

European physics faculties. We collaborate with leading groups of the top universities and research institutes worldwide, such as at Cambridge, Harvard, Princeton, Stanford, Riken, the Max Planck Society and NASA.

Our research in topological and correlated solid state physics receives multimillion Euro support in federal and European funding annually and has been recognized through multiple internally prizes individual and team awards. A recent contribution of our department is the first experimental realization of a topological insulator in 2007, which paved the way to establishing one of the most exciting and dynamic fields of modern research in physics. This work has led us to be recognized as one of only a dozen physics faculties in Germany to qualify for support within the German science excellence strategy, a recognition which led to the formation of an Excellence Cluster on correlated and topological materials. We continue to conduct world leading research in this expanding field, conducting investigations on all types of topologically non-trivial and/or correlated systems, including topological insulators, Weyl semimetals and correlated Kondo materials, as well as potential Majorana materials and topological superconductors, by a coordinated effort of experimentalists and theorists

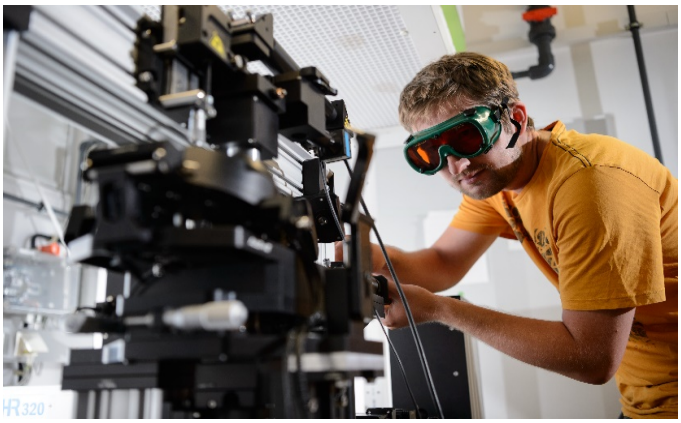


Our expertise in material synthesis, characterization and spectroscopy as well as in theoretical prediction and modeling and in the exploration of applications, allows us a cradle-to-paper approach, all within our faculty: Materials synthesized by our molecular beam epitaxy and pulsed laser deposition groups undergo structural, optical, magnetic and quantum transport measurements and are shared with groups performing a number of spectroscopy techniques. These include angle-resolved photoemission spectroscopy, spin-polarized scanning tunneling spectroscopy, electron and nuclear spin resonance spectroscopy and resonant X-ray spectroscopy, as well as electron microscopy. Research in theoretical physics develops and employs ab-initio, field-theoretical, many-body theory, Monte-Carlo and holographic methods.

Moreover, in the research area of photonics, several groups work on selected cutting-edge topics, such as technologies for renewable energy harvesting, molecular electronics, spintronics, nano-optics and quantum communication. Also here, a materials-oriented approach and the fabrication of unique nanostructures using high-end facilities forms the foundation stone of world-wide visibility. Other areas of the electromagnetic spectrum are covered by vivid and broad research activities in the field of magnetic resonance imaging as well as application-oriented research towards advanced x-ray imaging techniques. A wide range of epitaxial growth equipment for inorganic and organic semiconductor heterostructures, clean room facilities, spectroscopy labs and op notch nano fabrication tools are routinely used by our researchers and students.

We also conduct research devoted to the development of technologies for renewable energy harvesting, nano- and biophotonics, molecular electronics, quantum communication, spintronics and imaging techniques covering the spectroscopic range from radio waves (NMR) to X-rays. A wide range

of epitaxial growth equipment for inorganic and organic semiconductor heterostructures, clean room facilities, spectroscopy labs and lithography are routinely used by our researchers and students.



Furthermore, our research covers theoretical and experimental particle physics, theoretical and observational astrophysics and astronomy, as well as quantum field theory and string theory. In particular, we carry out both theoretical and experimental precision analyses of the Standard Model in view of finding deviations and signals for new physics. These include for instance electroweak symmetry breaking and the properties and decay modes of the Higgs boson. Further topics include the baryon asymmetry in the Universe. Neutrino physics and dark matter are studied both from the particle physics and the astronomy point of view. In astronomy, further major topics are high-energy astronomy and the study of cosmic particle accelerators, as well as solar physics. We perform multi-wavelength observations from both space-based and ground-based observatories. Within quantum field theory and string theory, we investigate the AdS/CFT correspondence, a map between quantum field theory and gravity. We study both its fundamental implications for quantum gravity, as well as its applications to particle and condensed matter physics. We also construct maps between quantum information theory and the quantum properties of black holes using the AdS/CFT correspondence.

Contents of Program

Both the M.Sc. programs in Physics and in Quantum Engineering are a two-year program with the first year focusing on a lecture-, seminar- and lab-course program to deepen and widen the knowledge of students based on their experience from B.Sc.-level studies. In the second year, students are working on a topical project in physics or quantum engineering integrated in a faculty research team under the supervision of a professor or senior scientist, leading to a master thesis. Both programs are compatible with the Bologna process of the European Higher Education Area.

All students of both programs will take courses in experimental and theoretical physics, an advanced seminar and an advanced lab course. There is a wide selection of elective courses including many courses on current research topics. These are given by active researchers in the respective fields to help students prepare for their own research.

In both the Physics and Quantum Engineering programs, students are advised to contact potential supervisors of their master thesis early for advice on which lectures are best suited for preparing them for their thesis topic of choice. Further detailed information on our teaching focus web pages.

City of Würzburg

Würzburg is a medium-sized university town located at the heart of Germany and the EU. It is located not far from Frankfurt airport and within a few hours ride – by train or car – of many large German and European cities. With its baroque architecture, the marvelous surrounding vineyards and its Mediterranean flair, Würzburg is sometimes referred to as the “northernmost city of Italy”. Würzburg is beautifully located at the Main river, overlooked by a medieval fortress. It also hosts the UNESCO world heritage baroque `Residenz’ palace with its world-famous staircase and ceiling fresco. With approximately 29.000 students among 130.000 inhabitants, Würzburg is one of the youngest cities in the region with large variety of cultural activities, where it is easy to make new friends. Würzburg is also considered one of the safest cities in Germany and has the advantage of comparably low living costs.

Our University, founded in 1402, looks back on a long tradition and eventful history. Today the main focus is on competitive and internationally visible research. The University of Würzburg is well connected in a dense network of research institutions in Southern Germany. Various spin-offs have settled close the University. Würzburg is also an infrastructure hub from which other locations in Germany can be easily reached, including important industrial companies as well as countless medium-sized companies. This makes the Faculty of Physics and Astronomy in Würzburg a place of choice to pursue a Master degree.

Language, Admission Requirements an and Application

The program is entirely in English. Moreover, because of the large student population and the tourist nature of the town, student social activities can also all be enjoyed without any difficulties while speaking only English. Hence, while students will be encouraged to learn some German (and the University offers free courses for those who wish), doing so is voluntary and not a necessity for neither your studies nor your day-to-day student activities. University administrative processes are also conducted in English. While some city administrative process are carried out in German, the program and the University provide guidance and interpretation support, such that these processes also can be easily navigated in English.

The following items are at least required for a successful application:

- A bachelor's degree (or equivalent) in physics, quantum engineering, nanophysics or applied physics from a state-recognized University.

- Proof of English skills (Bachelor degree in English language, or TOEFL = 72, or IELST = 6.0).

Your application will be reviewed by the faculties admissions committee, and students who are among the top 25% of their peer group can expect to be selected. Students may start (equivalently) in either the winter or summer semester. These begin in October or April, respectively.

Applications are reviewed on a rolling basis when received, and a decision on admission can be expected within two months. Applications for beginning in the winter semester have to be received by 15th July of each year at the latest. Similarly, applications for beginning in the summer semester have to be received by 15th January of each year. There is no application fee.

Apply Now !

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