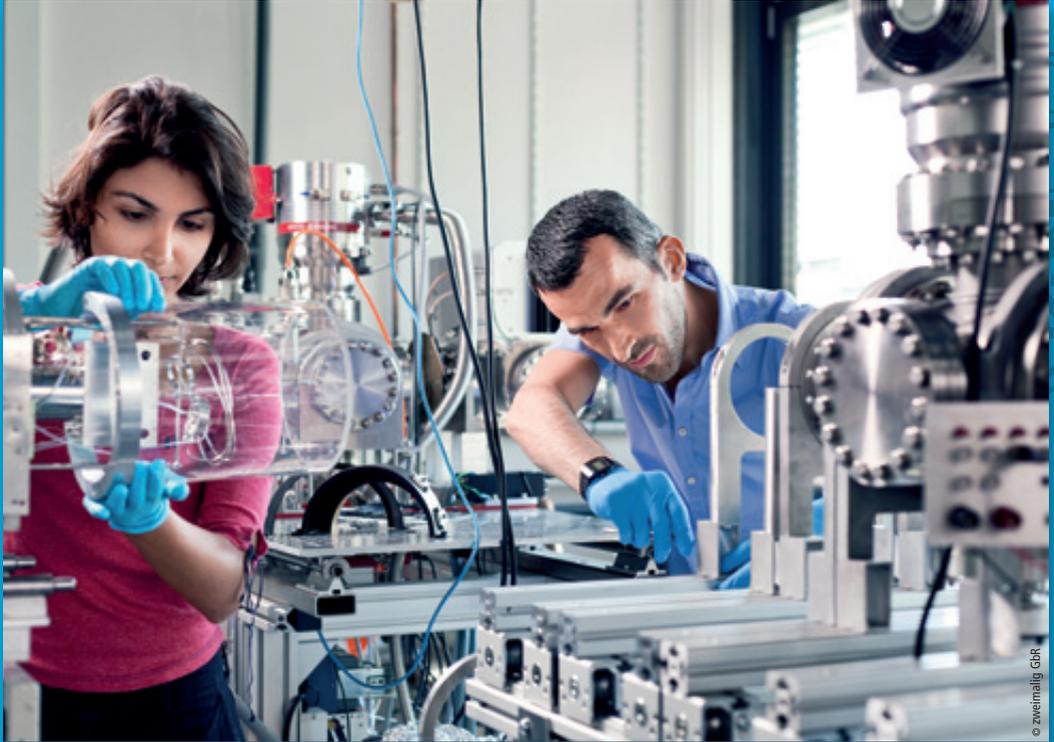


Physics

Master of Science



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Admission

Admission to the Master program requires a Bachelor of Science in physics or a comparable qualification. Courses are taught in English. Applications from foreign students are welcome.

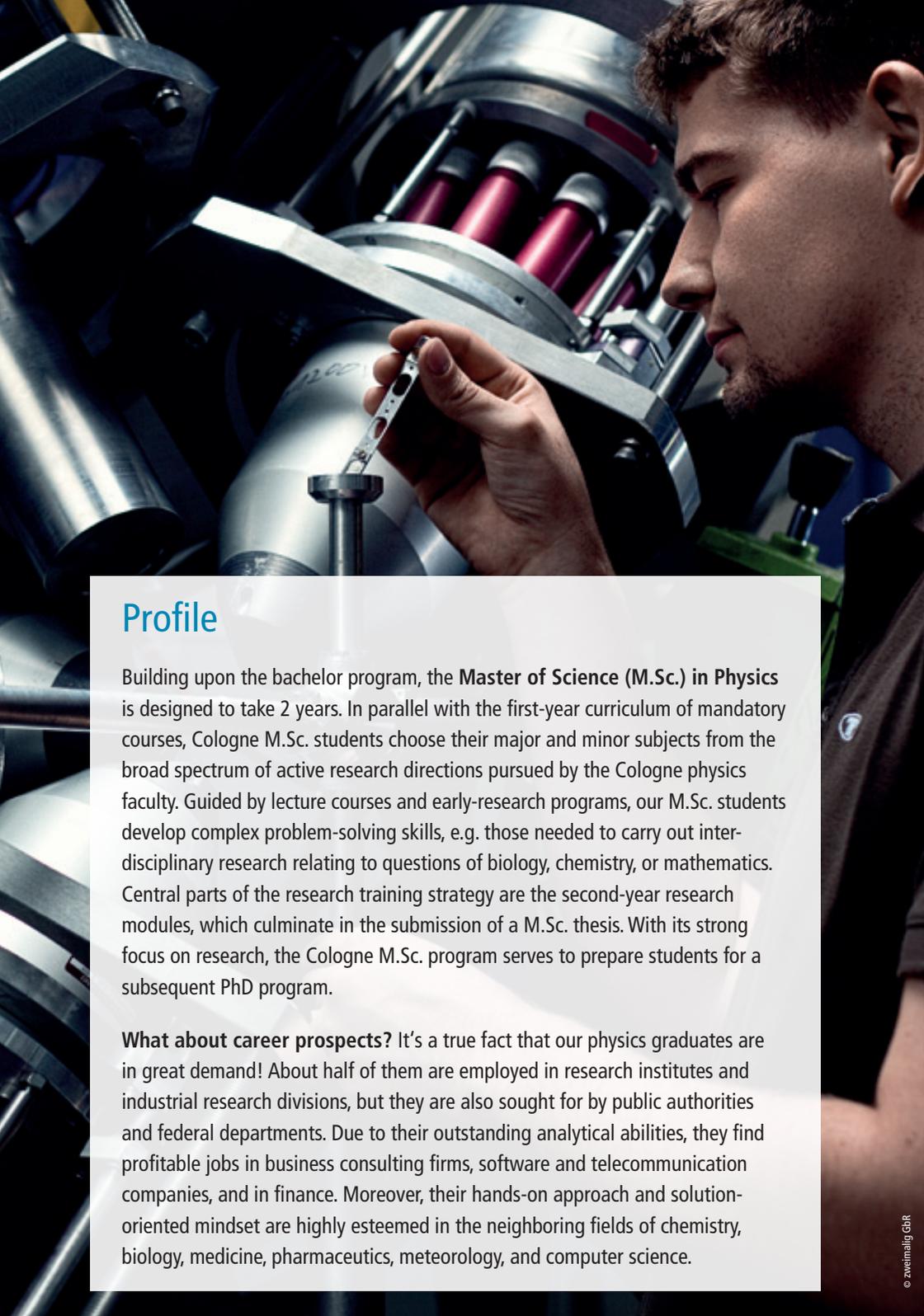
► **Deadlines: July 15th (winter term), January 15th (summer term)**

Information detailing the application process can be found on the following webpage:

<http://www.physik.uni-koeln.de/application-master.html>

Master of Science in Physics

By design, the Master of Science program imparts a comprehensive view of physics and its interrelations. Guided towards the frontier of current research, M.Sc. students acquire the scientific tools to tackle and solve problems of Modern Physics, some beyond present knowledge. A central element is the M.Sc. thesis research, a one-year process during which students develop their capabilities for responsible, critical, and independent thinking. Extending the work initiated in two introductory projects, they learn to do cutting-edge research, typically in their chosen areas of specialization. The M.Sc. research project concludes with the submission of a thesis. In Germany, the M.Sc. degree is a prerequisite for admission to any PhD program.



Profile

Building upon the bachelor program, the **Master of Science (M.Sc.) in Physics** is designed to take 2 years. In parallel with the first-year curriculum of mandatory courses, Cologne M.Sc. students choose their major and minor subjects from the broad spectrum of active research directions pursued by the Cologne physics faculty. Guided by lecture courses and early-research programs, our M.Sc. students develop complex problem-solving skills, e.g. those needed to carry out interdisciplinary research relating to questions of biology, chemistry, or mathematics. Central parts of the research training strategy are the second-year research modules, which culminate in the submission of a M.Sc. thesis. With its strong focus on research, the Cologne M.Sc. program serves to prepare students for a subsequent PhD program.

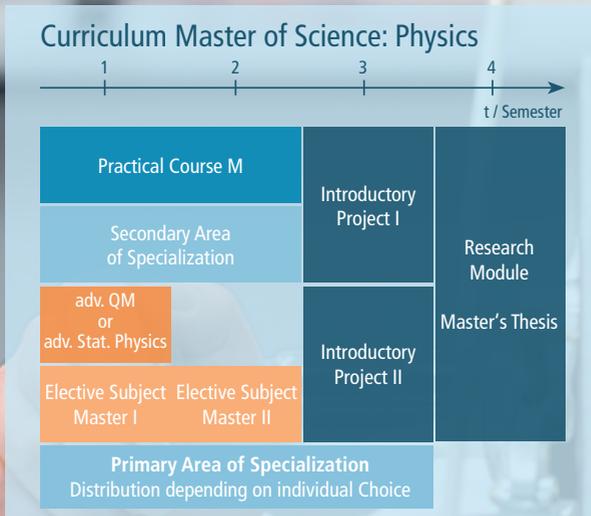
What about career prospects? It's a true fact that our physics graduates are in great demand! About half of them are employed in research institutes and industrial research divisions, but they are also sought for by public authorities and federal departments. Due to their outstanding analytical abilities, they find profitable jobs in business consulting firms, software and telecommunication companies, and in finance. Moreover, their hands-on approach and solution-oriented mindset are highly esteemed in the neighboring fields of chemistry, biology, medicine, pharmaceuticals, meteorology, and computer science.

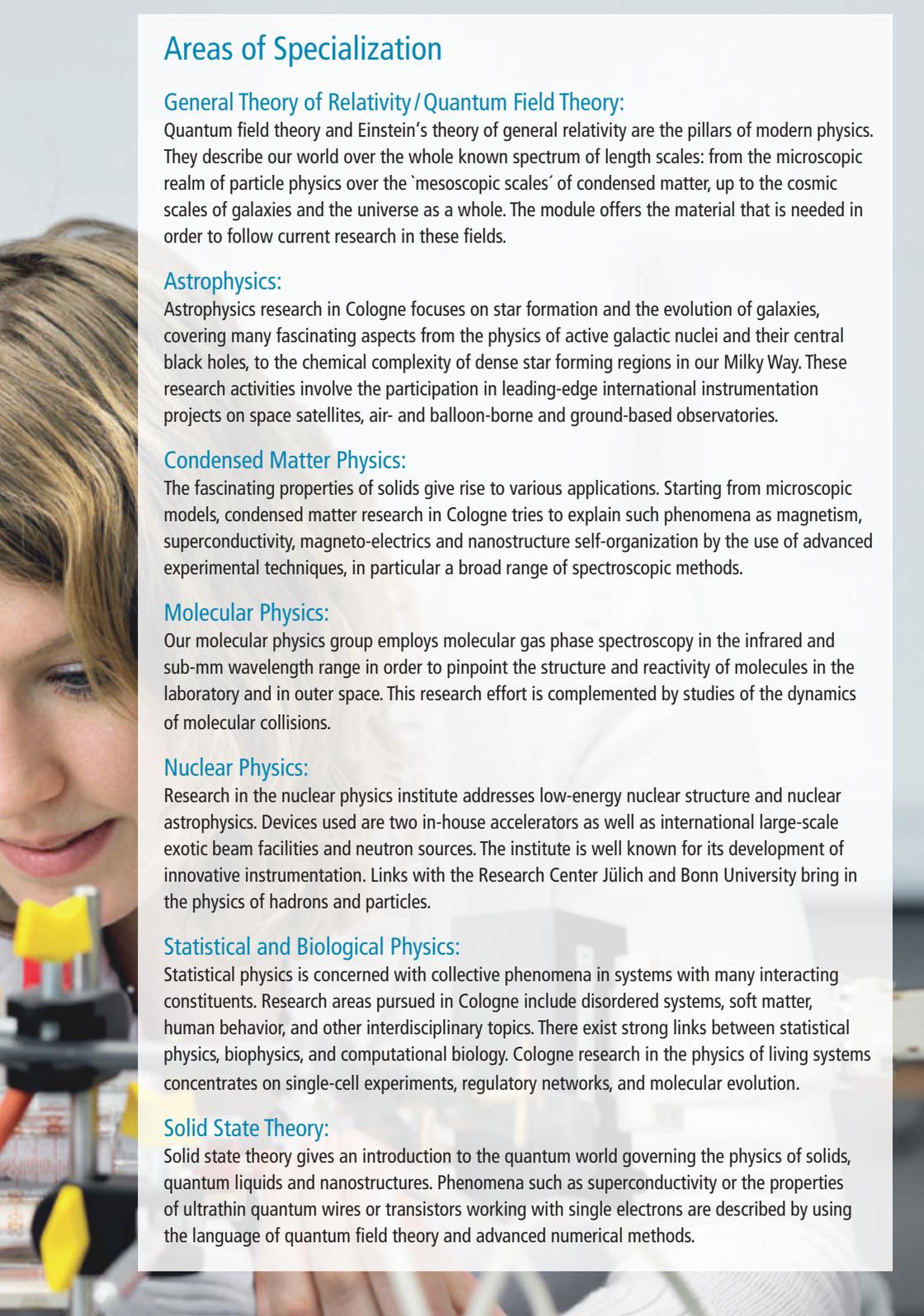
Curriculum

Structured by about a dozen of modules, the Master of Science program normally takes four semesters to complete. The program consists of mandatory and elective parts, the latter including two research-based main subjects from the spectrum offered by Cologne physics. While the lecture courses on Advanced Quantum Mechanics and Advanced Statistical Physics are taught only in the winter term, all laboratory courses, elective subjects, primary and secondary areas of specialization, and the M.Sc. thesis project, can be scheduled flexibly.

Areas of specialization are: General relativity/quantum field theory, astrophysics, condensed matter physics, molecular physics, nuclear and particle physics, statistical and biological physics, and solid state theory. This spectrum is bolstered by the further options of cosmology, experimental hadron physics, high energy particle physics, theoretical hadron physics, theoretical particle physics, quantum optics and optical condensed matter physics, and medical physics. Offered by our partner physics department at Bonn University, these are accepted in Cologne as secondary areas of specialization.

Two electives provide the student with opportunities to venture into neighboring disciplines, or explore physics beyond the two areas of specialization.





Areas of Specialization

General Theory of Relativity / Quantum Field Theory:

Quantum field theory and Einstein's theory of general relativity are the pillars of modern physics. They describe our world over the whole known spectrum of length scales: from the microscopic realm of particle physics over the 'mesoscopic scales' of condensed matter, up to the cosmic scales of galaxies and the universe as a whole. The module offers the material that is needed in order to follow current research in these fields.

Astrophysics:

Astrophysics research in Cologne focuses on star formation and the evolution of galaxies, covering many fascinating aspects from the physics of active galactic nuclei and their central black holes, to the chemical complexity of dense star forming regions in our Milky Way. These research activities involve the participation in leading-edge international instrumentation projects on space satellites, air- and balloon-borne and ground-based observatories.

Condensed Matter Physics:

The fascinating properties of solids give rise to various applications. Starting from microscopic models, condensed matter research in Cologne tries to explain such phenomena as magnetism, superconductivity, magneto-electrics and nanostructure self-organization by the use of advanced experimental techniques, in particular a broad range of spectroscopic methods.

Molecular Physics:

Our molecular physics group employs molecular gas phase spectroscopy in the infrared and sub-mm wavelength range in order to pinpoint the structure and reactivity of molecules in the laboratory and in outer space. This research effort is complemented by studies of the dynamics of molecular collisions.

Nuclear Physics:

Research in the nuclear physics institute addresses low-energy nuclear structure and nuclear astrophysics. Devices used are two in-house accelerators as well as international large-scale exotic beam facilities and neutron sources. The institute is well known for its development of innovative instrumentation. Links with the Research Center Jülich and Bonn University bring in the physics of hadrons and particles.

Statistical and Biological Physics:

Statistical physics is concerned with collective phenomena in systems with many interacting constituents. Research areas pursued in Cologne include disordered systems, soft matter, human behavior, and other interdisciplinary topics. There exist strong links between statistical physics, biophysics, and computational biology. Cologne research in the physics of living systems concentrates on single-cell experiments, regulatory networks, and molecular evolution.

Solid State Theory:

Solid state theory gives an introduction to the quantum world governing the physics of solids, quantum liquids and nanostructures. Phenomena such as superconductivity or the properties of ultrathin quantum wires or transistors working with single electrons are described by using the language of quantum field theory and advanced numerical methods.



Bonn-Cologne Graduate School of Physics and Astronomy

The Bonn-Cologne Graduate School of Physics and Astronomy is an honors program of graduate studies offered jointly by the physics departments of the Universities of Bonn and Cologne. Directed at gifted students holding a Bachelor's degree in physics, the 5-year BCGS program guides its students through the M.Sc. phase directly to the PhD.

BCGS has been receiving funding from the German Excellence Initiative since 2007. The School owes its success to the outstanding and internationally visible research environments of the physics departments in Bonn and Cologne and their innovative concepts in graduate education.

Due to the intense Bonn-Cologne cooperation within BCGS, our students benefit from a significant increase in the number of research topics offered as M.Sc. secondary areas of specialization.

Cooperation partners:

- Max Planck Institute for Radio Astronomy Bonn
- Research Center Jülich
- Deutsche Telekom Stiftung

More details:

www.gradschool.physics.uni-koeln.de
Contact: Dr. Petra Neubauer-Guenther
gradschool.physics@uni-koeln.de





What's attractive about Cologne?

Enrolling in a **Master of Science in Physics at Cologne** offers quite a number of advantages:

- **Quality of teaching:** funded by the German Excellence Initiative, the Bonn-Cologne Graduate School of Physics and Astronomy leads students with a B.Sc. degree through the M.Sc. phase directly to doctoral studies.
- **The high quality of Cologne physics research** is documented by four Collaborative Research Centers (SFBs), as well as numerous other projects funded by the DFG and the BMBF, and a recent Leibniz award.
- **There is a wide range of research subjects to choose from:** structure of matter, black holes, physics of the interstellar medium, condensed matter physics and solid state theory, molecular evolution, biophysics of the cell, theory of mesoscopic systems, nuclear physics, and others.

Additional incentives to study in Cologne are provided by the integration into **international cooperation projects** and by collaborations with biologists, chemists, or mathematicians in **interdisciplinary research projects**. Moreover, the triangle of the cities of Aachen, Bonn and Cologne, often referred to as the **ABC region**, constitutes a strong network of renowned research facilities. These include the Research Center Jülich and several Max-Planck Institutes located in the vicinity. A number of collaborations between the corresponding institutions have established a unique and fruitful research environment.



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■ Brief information

Duration: **4 terms (full time study)**
 Start: **winter or summer semester**
 Information: **www.physik.uni-koeln.de**
 Degree: **Master of Science**

■ Advisory Service

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