

## Fundamentals

16 ECTS

- Research lab work
- Advanced quantum theory

## Specialisation

32 ECTS

### Optics

- Lens design
- Laser physics
- Biophotonics
- Optical modeling
- Nonlinear optics
- Fiber optics

### Theoretical Physics

- General relativity
- Quantum field theory
- Gravitational waves
- Numerical relativity
- String theory
- AdS/CFT

### Astrophysics

- Neutron stars
- Celestial mechanics
- Planetary systems
- Spectroscopy
- Cosmology
- Observing techniques

### Solid State Physics

- Solid state optics
- 2D materials
- Nano materials
- Materials science
- Semiconductors
- Low temperature

## Free Electives

12 ECTS

- Modules from science, languages or arts

## Research Phase

60 ECTS

- Project planning
- Introduction to research methods
- Master's Thesis

$\Sigma$  120 ECTS  
in 2 years  
M.Sc. Physics

## Selection of regularly offered specialisation courses

### Astronomy & Astrophysics

Astronomical Observing Techniques  
Astronomical Practicum

Astronomical Spectroscopy  
Celestial Mechanics  
Cosmology  
Extragalactic Astrophysics  
History of Astronomy\*  
Introduction to Astronomy\*  
Introduction to Radio Astronomy\*  
Laboratory Astrophysics\*  
Neutron Stars\*  
Physics of Planetary Systems  
Stellar Physics\*  
Terra Astronomy\*  
The Solar System\*

### Gravitation & Quantum Theory

Quantum Field Theory  
Computational Physics  
Gauge Theories  
String Theory & AdS/CFT  
Lattice Field Theory  
Particles and Fields  
Physics of Scales  
Physics of the Quantum Vacuum  
The Standard Model  
Symmetries in Physics

General Relativity  
Gravitational Waves  
Numerical General Relativity  
Relativistic Astrophysics  
Magnetohydrodynamics

\*frequently held in German language

### Optics & Photonics

Laser Physics  
High-Intensity/Relativistic Optics  
Ultrafast Optics  
XUV and X-Ray Optics  
Plasma Physics

Introduction to nanooptics  
Photonic Materials  
Active photonic devices  
Semiconductor nanomaterials  
Optoelectronics  
Micro/nanotechnology

Computational Photonics  
Design and correction of optical systems  
Lens design  
Physical Optics Simulation  
Imaging and aberration theory  
Optical Design with Zemax  
Thin Film Optics

Experimental Nonlinear Optics  
Theory of Nonlinear Optics  
Nonlinear Dynamics in Optics

Quantum Optics  
Experimental Quantum Technologies  
Quantum Communication  
Quantum Imaging and Sensing  
Integrated Quantum Photonics  
Quantum Computing

### Solid-State Physics & Material Science

Electronic Structure Theory  
2D materials  
Biomaterials and Medical Technology  
Electronmicroscopy\*  
Introduction to Material Science\*  
Ion Beam Physics\*  
Nanomaterials und Nanotechnology\*  
Nuclear Solid State Physics\*  
Optoelectronics  
Phase Field Theory  
Physics of Semiconductors\*  
Physics of Vacuum and Thin Films\*  
Solid State Optics  
Superconductivity\*  
Surface Science\*  
Theoretical Solid State Physics