Study Plan with specialization "Experimental Particle Physics"

Semester	Module	CP	Analysis	Instrumentation
Bachelor				
4	Lecture Statistical Methods of Data Analysis A	4	elective (recommended)	elective
5	Lecture Introduction to Nuclear and Elementary Particle Physics	6	mandatory	
	Lecture Particle Physics 1	3	elective (recommended)	elective (recommended)
	Lecture SMD B	5	elective (recommended)	elective
6	Bachelor thesis with focus on Experimental Particle Physics	10	mandatory	
	Seminar Specific topics of Particle Physics	3	elective (recommended)	elective (recommended)
Master				
1	Lecture Introduction to Elementary Particle Theory	12	elective (recommended)	Compulsory elective
	Seminar Detector systems in Particle Physics and Medical Physics	3	elective	elective (recommended)
	Seminar Key Experiments in Particle Physics	4	elective (recommended)	elective
	Further modules with focus on Particle Physics (*)	Variable	elective	elective
2	Lecture Experimental Aspects of Particle Physics	6	elective (recommended)	elective
	Lecture Fundamentals of Detector Physics	3	elective (recommended)	elective (recommended)
	Lecture Electronics	8	elective	elective (recommended)
	Advanced Laboratory Electronics	6	elective	elective (recommended)
	Advanced Laboratory Particle Physics	6	elective (recommended)	elective (recommended)
	Lecture/seminar Practicle Aspects of Instrumentation	3-9	elective	elective (recommended)
	Further modules with focus on Particle Physics (**)	Variabel	elective	elective
3/4	Master thesis with focus on Experimental Particle Physics	60	mandatory	

Examples modules:
(*) MSc WS: block course Statistical Methods of Data Analysis 2; specialized lecture e.g. Top or Flavor Physics
(**) MSc SS: Lectures: Flavor Physics in Experiment and Theory, Astro Particle Physics, seminars: False Discoveries in Particle Physics, Machine Learning

Study Plan with specialization “Astro Particle Physics”

Semester	Module	CP	Astro Particle
Bachelor			
4	Lecture Statistical Methods of Data Analysis A	4	elective (recommended)
	Lecture Astro Particle Physics	6	elective (recommended)
5	Lecture Introduction to Nuclear and Elementary Particle Physics	6	Mandatory
	Seminar Radio Astronomy	3	elective (recommended)
	Lecture Statistical Methods of Data Analysis B	5	elective (recommended)
6	Bachelor thesis with focus on Astro Particle Physics	10	Mandatory
Master			
1	Lecture Introduction to Elementary Particle Theory	12	elective (recommended)
	Lecture Astro Particle Physics II	3	elective (recommended)
	Seminar Neutrino and Gamma Astronomie	3	elective (recommended)
2	Futher Seminar focusing Astro Particle Physics	3	elective (recommended)
	Lecture Electronics	8	
	Advanced Laboratory Electronics	6	
	Advanced Laboratory Particle Physics	6	
	Seminar Detector Systems in Particle and Medical Physics	3	
	Futher modules with focus on Astro Particle Physics (*)	Variable	
3/4	Bachelor thesis with focus on Astro Particle Physics	60	Mandatory

Beispielveranstaltungen:
(*) Lecture Statistical Methods of Data Analysis 2, Seminar Gamma and Neutrino Astronomy, Seminar Cosmic Radiation

Study Plan with specialization “Theoretical Particle Physics”

Semester	Module	CP	Theory
Bachelor			
5	Lecture Introduction to Nuclear and Elementary Particle Physics	6	Mandatory
6	Bachelor thesis with focus on Theoretical Particle Physics	10	Mandatory
	Lecture Higher Quantum Mechanics	6	Elective (recommended)
	Lecture General Relativity Theory	6	Elective
Master			
1	Lecture Elementary Particle Theory	12	Compulsary elective (recommended)
	BSM and/or Big Questions Seminar	3	Elective (recommended)
	Seminar Actual Problems in Particle Theory	-	Teilnahme (empfohlen)
	Futher modules focusing Particle Theory (*)	Variable	Elective (recommended)
2	BSM and/or Seminar Neutrinos and Cosmologie	3	Elective (recommended)
	Futher modules focusing Particle Theory (*)	Variable	Elective (recommended)
3/4	Master thesis with focus on Theoretical Particle Physics	60	

Examples modules:
(*) Quantum Field Theory of Elementary Particles , Cosmology, Flavor Theory, Grand Unified Theories, Group Theory, General Relativity Theorie

Study Plan with specialization „Experimental Solid State Physics“

Semester	Module	CP	
Bachelor			
5	Introduction to Solid State Physics	9	mandatory
6	Seminar focusing Solid State Physics or Optics	3	Elective (recommended)
	Advanced Solid-State Physics I: Semiconductors and Light-Matter Interaction	6	Elective (recommended)
	Bachelor thesis with focus on Experimental Solid State Physics	10	mandatory
Master			
1	Introduction to Theoretical Solid State Physics	12	Compulsary elective (required)
	Advanced Solid-State Physics II: Magnetism and Superconductivity	6	Elective (recommended)
	Advanced Laboratory	6	mandatory
	Seminar focusing Solid State Physics or Optics	3	Elective (recommended)
2	For those interested in theory: Theorie module concerning Solid State Physics: Higher Quantum Mechanics, Soft Matter Theory, Solid-State Theory II, Computational Physics	~6	Elective
	Helpful for many specializations: Electronics	8	Elective
	Seminar focusing Solid State Physics or Optics	3	Elective (recommended)
	Advanced Laboratory 2: Solid State Physics	6	Elective (recommended)
	1-2 specialization module(s) focusing Solid State Physics/ Optics, e.g. Quantum Opctics, Measurement Techniques in Surface Physics	Je 3-6	Elective
3/4	Research Phase focusing experimental Solid State Physics, consisting of the modules Research Laboratory, methods and project planning and Master Thesis	60	mandatory

Study Plan with specialization „Condensed Matter Theory”

Semester	Module	CP	
Bachelor			
5	Introduction to Solid State Physics	9	mandatory
	Thermodynamics und Statistics	9	mandatory
6	Computational Physics (also in Master)	9	Elective (recommended)
	Higher Quantum Mechanics (also in Master)	6	Elective
	Theory of soft and biological Matter I (also in Master)	6	Elective
	Group Theory (also in Master)	5-6	Wahl
	Machine Learning (also in Master)	4	Wahl
	Bachelor Thesis with focus on Condensed Matter Theory	10	mandatory
Master			
1	Introduction in Theoretical Solid State Physics	12	Compulsary elective (required)
	Specialization modules focusing Solid State Physics, magnitism, soft/biological matter, superconductivity, quantum physics, surface physics, see also Bachelor	3-6	Elective (recommended)
	Advanced Laboratory	6	mandatory
2	Multi particle solid state theory	8	Elective (recommended)
	Soft and biological Matter Theory II	4	Elective
	Introduction to the Renormalization Group	4	Elective
	Advanced Methods in Solid State Theory	6	Elective
	Theory of Magnetism in Solid States	6	Elective
	Seminar Theoretical Problems of condensed matter	3	Elective (recommended)
	Advanced Laboratory II: Theory course	6	Compulsary elective (recommended)
	Seminaraccompanying the theory course	3	Compulsary elective (recommended)
3/4	Research Phase focusing the Theory of condensed matter consisting of the modules Research Laboratory, methods and project planning and Master Thesis	60	mandatory

Study Plan with specialization “Quantum Technologies“

Semester	Module	CP	
Bachelor (17 cp in total for electives courses**)**			
5	Lecture „Einführung in die Festkörperphysik“	9	mandatory
5	Lecture “Einführung in die Quantentechnologien" (Cygorek, Fauseweh, Narevicius, Reiter, Weitenberg)	3	elective (recommended)
5	Lab Course "Modern methods in experimental quantum physics" (Narevicius/Weitenberg)	3	elective
6	Lecture "Cold atoms and molecules" (Narevicius/Weitenberg) (*)	6	elective
6	Lecture "Advanced solid state physics I"	6	elective
6	Lecture “Higher quantum mechanics" (*)	6	elective
6	Seminar "Quantum technologies with atoms and photons" (Narevicius/Weitenberg) (*)	3	elective
6	Seminar "Modern optics" (Aßmann) (*)	3	elective
6	Bachelor thesis in AMO physics, solid state physics, or quantum information theory	10	mandatory
Master (10-14 cp in total for elective courses forming the physics specialization plus 6 cp for seminars, which can also be in the physics specialization)			
1	Lecture “Introduction to theoretical solid-state physics”	12	compulsory elective
1	Seminar "Quantum simulation with cold atoms and molecules" (Narevicius/Weitenberg)	4	elective
1	Advanced laboratory course I	6	mandatory
2	Advanced laboratory course II: AMO Physics, Solid state, Theoreticum or Electronics	6	elective (recommended)
2	Lecture „Quantum optics“, "Light-matter interactions" or "Theory of open quantum systems" (Aßmann, Cygorek, Lange, Reiter)	3-6	elective
2	Lecture "Quantum computing and quantum simulation" (Fauseweh) (**)	6	elective
2	Seminar "Light-matter interactions" (Lange) (**)	3	elective
3 and 4	Master thesis in AMO physics, solid state physics, or quantum information theory	60	mandatory

(*) These courses can also be taken in the 2nd semester of the Master
(**) These courses can also be taken in the 6th semester of the Bachelor