

Master's curriculum Applied Physic 2024-2025

For students enrolled in academic year 2024-2025

First year (M1)			
Course code	Name	Planning	EC
Compulsory courses			20
202200093	Quantum Mechanics 2	Q1/1A	5.0
201900080	Mathematical and Numerical Physics	Q2/1B	5.0
191470241	Heat and Mass Transfer	Q3/2A	5.0
201900282	Small Signals and Detection	Q4/2B	4.0
201900281	Ethical and Cultural Awareness	Q4/2B	1.0
Electives			10/20
	Electives physics/technical ¹		10.0
	Free electives master's level ²		0/10
Specialisation courses. (See page 2 onwards.)			20
Second year (M2)			
Course code	Name	Planning	EC
Internship (1 of 2)²			20/30
193599010	Internship AP	Year	20.0
201700185	Internship AP	Year	30.0
Master's Assignment			40
201800344	Master's Assignment: Physics Aspects	Year	20.0
201800345	Master's Assignment: General Aspects	Year	20.0
Total master			120

¹ Through a *Capita Selecta* course, a specific educational course can be conducted within a department.
This course can be used as a specialisation course or as a Technical or Physics elective.

² The student may choose to do a 30 EC instead of a 20 EC internship.
In that case, the 10 EC of free electives are forfeited

Applied Physics research departments specialisations

Department Applied NanoPhotonics (ANP)			
<i>AQO (Pinkse), BMPI (Steenbergen), COPS (Vos), IOS (Garçia Blanco) NLNP (Marpaung), OS (Offerhaus)</i>			
Course code	Name	Planning	EC
General Applied Nanophotonics			
202200044	Fundamentals of Photonics	Q1/1A	5.0
Tracks Applied NanoPhotonics			
Biomedical Optics			
202000663	Molecular Structure and Spectroscopy (part of AT module 9)	Q1/1A	2.5
202200295	Laser Physics and Nonlinear Optics	Q2/1B	5.0
193500000	Biomedical Optics	Q4/2B	5.0
Integrated Optics			
202200295	Laser Physics and Nonlinear Optics	Q2/1B	5.0
191210880	Integrated Optics	Q3/2A	5.0
202200045	Integrated Photonic Systems and Experiments	Q3/2A	5.0
Light and Matter Interaction			
202200046	Light and Matter	Q1/1A	5.0
202200048	Classical and Quantum Emitters	Q3/1A	5.0
202200047	NanoPlasmonics	Q4/2B	5.0
Quantum Optics			
202100078	Quantum Information	Q1/1A	5.0
202100083	Quantum Optics	Q2/1B	5.0
191210880	Integrated Optics	Q3/2A	5.0
Recommended electives Applied NanoPhotonics			
-	All courses from the other specialisations within the ANP department		
202200103	Image Processing and Computer Vision	Q1/1A	5.0
202400632	Introduction to Partial Differential Equations	Q3/2A	4.0
201500405	Complex Function Theory	Q4/2B	3.0

Department Nano Electronic Materials (NEM)			
<i>CCP (Filippi), EMS (van Oort), ICE (Hilgenkamp), IMS (Rijnders), PIN (Zandvliet), QTM (Brinkman), XUV (Ackermann),</i>			
Course code	Name	Planning	EC
Energy Materials & Systems (EMS)			
193530000	Introduction to Superconductivity	Q1/1A	5.0
201100214	Applications of Superconductivity	Q2/1B	5.0
202400605	Cooling Science and Technology	Q4/2B	5.0
Recommended electives EMS			
193570010	Advanced Fluid Mechanics	Q1/1A	5.0
193530010	Nanophysics	Q1/1A	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
193530040	Introduction to High Energy Physics	Q2/1B	5.0
193565000	Capillarity Phenomena	Q2/1B	5.0
201700026	Electrical Power Engineering and System Integration	Q2/1B	5.0
193550020	Surfaces and Thin Layers	Q3/2A	5.0
193580020	Experimental Techniques in Physics of Fluids	Q3/2A	5.0
201400037	Linear Solid Mechanics	Q3/2A	5.0
201800131	Numerical Methods for Engineers	Q4/2B	5.0

Computational Chemical Physics (CCP)			
193570050	Advanced Quantum Mechanics	Q2/1B	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
202100210	Electronic Structure Theory	Q4/2B	5.0
<i>Recommended electives CCP</i>			
202000694	Classical Mechanics	Q1/1A	5.0
202100078	Quantum Information	Q1/1A	5.0
193530010	Nanophysics	Q1/1A	5.0
202100223	Computational Physics	Q3/2A	5.0
202100224	Machine Learning	Q3/2A	3,0/5,0
193570040	Theory of General Relativity	Q4/2B	5.0
201500405	Complex Function Theory	Q4/2B	5.0
200900066	Introduction to the Physics of Correlated Electrons	Q4/2B	5.0

Industrial Focus Group XUV Optics (XUV)			
193530010	Nanophysics	Q1/1A	5.0
193550020	Surfaces and Thin Layers	Q3/2A	5.0
202300191	X-rays for Science and Technology	Q4/2B	5.0
<i>Electives 1 of 3</i>			
193700010	AMM-Characterisation	Q1/1A	5.0
202200044	Fundamentals of Photonics	Q1/1A	5.0
193700040	AMM-Inorganic Materials Science	Q3/2A	5.0
<i>Recommended elective courses, the aforementioned 3 plus:</i>			
201900042	Nanomaterials Research	Q1/1A	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
193570050	Advanced Quantum Mechanics	Q2/1B	5.0
191210730	Fabrication of Micro- and Nanodevices	Q2/1B	5.0

Inorganic Materials Science (IMS)			
193700010	AMM-Characterization	Q1/1A	5.0
193700040	AMM-Inorganic Materials Science	Q3/2A	5.0
<i>Electives 1 of 3</i>			
202200044	Fundamentals of Photonics	Q1/1A	5.0
193550020	Surfaces and Thin Layers	Q3/2A	5.0
201700025	Solar Energy	Q3/2A	5.0
<i>Recommend elective courses IMS</i>			
193530010	Nanophysics	Q1/1A	5.0
193530000	Introduction to Superconductivity	Q1/1A	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
202200295	Laser Physics and Nonlinear Optics	Q2/1B	5.0
200900066	Introduction to the Physics of Correlated Electrons	Q4/2B	5.0

Interfaces and Correlated Electron Systems (ICE)			
193530010	Nanophysics	Q1/1A	5.0
193530000	Introduction to Superconductivity	Q1/1A	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
<i>Recommended electives courses ICE</i>			
202100078	Quantum Information	Q1/1A	5.0
200900066	Introduction to the Physics of Correlated Electrons	Q4/2B	5.0

Physics of Interfaces and Nanomaterials (PIN)			
193530010	Nanophysics	Q1/1A	5.0
193550020	Surfaces and Thin Layers	Q3/2A	5.0
201500167	Modern Topics in Condensed Matter Physics	Q4/2B	5.0
<i>Recommended Elective courses PIN</i>			
193510040	Theoretical Solid State Physics	Q2/1B	5.0
200900066	Introduction to the Physics of Correlated Electrons	Q4/2B	5.0
201100254	Advanced Computer Vision and Pattern Recognition	Q4/2B	5.0

Quantum Transport in Matter (QTM)			
193530010	Nanophysics	Q1/1A	5.0
193530000	Introduction to Superconductivity	Q1/1A	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
<i>Recommended elective courses QTM</i>			
202100078	Quantum Information	Q1/1A	5.0
200900066	Introduction to the Physics of Correlated Electrons	Q4/2B	5.0

Departement Physics of Fluids (POF)			
<i>Reseach groups: PoF (Lohse)</i>			
Course code	Name	Planning	EC
193570010	Advanced Fluid Mechanics	Q1/1A	5.0
193580020	Experimental Techniques in Physics of Fluids	Q3/2A	5.0
<i>Electives 10 EC out of:</i>			
193580010	Turbulence (recommended)	Q2/1B	5.0
193572010	Physics of Bubbles	Q2/1B	2.5
193565000	Capillarity Phenomena (recommended)	Q2/1B	5
201400194	Granular Matter	Q3/2A	5.0
193542070	Medical Acoustics	Q4/2B	5.0
201800131	Numerical Methods for Engineers *	Q4/2B	5.0
191154731	Computational Fluid Dynamics *	Q4/2B	5.0
* Due to overlap, these may not be chosen together			
<i>Recommended elective courses, all the aforementioned plus:</i>			
191560430	Nonlinear Dynamics	Q1/1A	5.0
202001413	Soft Matter Physics	Q3/2A	5.0
193400121	Nano-Fluidics	Q3/2A	5.0
201500405	Complex Function Theory	Q4/2B	3.0

Applied Physics focus specialisations

Quantum Electronics			
<i>Research groups: CCP (Filippi), ICE (Hilgenkamp), NE (Wiel, van der), PIN (Zandvliet), QTM (Brinkman)</i>			
Course code	Name	Planning	EC
202100078	Quantum Information	Q1/1A	5.0
193570050	Advanced Quantum Mechanics	Q2/1B	5.0
<i>Quantum Electronics Electives 10 EC of;</i>			
193530010	Nanophysics	Q1/1A	5.0
193530000	Introduction to Superconductivity	Q1/1A	5.0
193510040	Theoretical Solid State Physics	Q2/1B	5.0
193530040	Introduction to High Energy Physics	Q2/1B	5.0
193400141	Nano-Electronics	Q2/1B	5.0
200900066	Introduction to Physics of Correlated Electrons	Q4/2B	5.0
202100210	Electronic Structure Theory	Q4/2B	5.0

Quantum Optics			
<i>Research groups: AQO (Pinkse), NLNP (Marpaung), IOS (García Blanco), COPS (Vos), NBP (Claessens), OS (Offerhaus), HMOE (Nijhuis)</i>			
Course code	Name	Planning	EC
202100078	Quantum Information	Q1/1A	5.0
193570050	Advanced Quantum Mechanics	Q2/1B	5.0
<i>Quantum Optics Electives 10 EC of;</i>			
202200044	Fundamentals of Photonics	Q1/1A	5.0
202100083	Quantum Optics	Q2/1B	5.0
191210880	Integrated Optics	Q3/2A	5.0

Digitizing Physics / Machine Aided Physics*			
<i>Research groups: tbd</i>			
Course code	Name	Planning	EC
<i>Recommended electives</i>			
202200103	Image Processing and Computer Vision	Q1/1A	5.0
202100223	Computational Physics	Q3/2B	5.0
202100224	Machine Learning	Q3/2B	3,0/5,0
202100225	Remote Control of Experiments	Q3/2B	2,5/5,0
201800131	Numerical Methods for Engineers	Q4/2B	5.0
201100254	Advanced Computer Vision and Pattern Recognition	Q4/2B	5.0
191154731	Computational Fluid Dynamics	Q4/2B	5.0

* This specialisation is under development. Contact the study advisor when interested.

Multidisciplinary specialisations

Soft Matter			
<i>Master programmes: Applied Physics & Chemical Science and Engineering</i>			
Course code	Name	Planning	EC
201800083	Advanced Colloids and Interfaces	Q1/1A	5.0
201700187	Soft and Biological Techniques	Q1/1A	5.0
202001413	Soft Mater Physics	Q3/2A	5.0
<i>Soft Matter electives 5 EC of;</i>			
193640020	Biophysical Techniques and Molecular imaging	Q1/1A	5.0
201800014	Electrochemistry: Fundamentals & Techniques	Q2/1B	5.0
193730060	Polymer Physics	Q3/2A	5.0
193400121	Nano-Fluidics	Q3/2A	5.0

Fluid Mechanics			
<i>Master programmes: Applied Physic & Mechanical Engineering</i>			
Course code	Name	Planning	EC
1 of 2;			
193570010	Advanced fluid mechanics	Q1/1A	5.0
201500136	Fluid Mechanics II	Q1/1A	5.0
Mandatory;			
193580020	Experimental Techniques in Physics of Fluids	Q3/2A	5.0
Electives 1 of;			
201800083	Advanced colloids and interfaces	Q1/1A	5.0
191157750	Engineering Acoustics	Q1/1A	5.0
202000245	Experimental methods in Fluid and Thermal Engin	Q1/1A	5.0
201900074	Fundamentals of Numerical Methods	Q1/1A	5.0
202200103	Image processing and computer vision	Q1/1A	5.0
191560430	Nonlinear dynamics	Q1/1A	5.0
201500024	Advanced Thermodynamics	Q2/1B	5.0
201900091	Advanced Topics in Finite Element Methods	Q2/1B	5.0
191154720	Fluid Mechanics of Turbomachines 1	Q2/1B	5.0
202200266	Hydrogen Technology	Q2/1B	5.0
201800327	Ion Transport in Fluids	Q2/1B	2.5
193572010	Physics of bubbles	Q2/1B	2.5
193580010	Turbulence	Q2/1B	5.0
202300225	Basics of acoustics & aero-acoustics	Q4/2B	5.0
202000244	Aircraft & Wind Turbine Aerodynamics	Q3/2A	5.0
202001436	Biofluid Dynamics	Q3/2A	5.0
191154340	Gasdynamics	Q3/2A	5.0
201400194	Granular matter	Q3/2A	5.0
193400121	Nano-fluidics	Q3/2A	5.0
202300266	Rheology & Processing of Thermoplastics	Q3/2A	5.0
202001413	Soft matter physics	Q3/2A	5.0
191155730	Tribology	Q3/2A	5.0
201700218	Turbulent Combustion	Q3/2A	5.0
201100254	Advanced computer vision and pattern recognition	Q4/2B	5.0
193565000	Capillarity phenomena	Q4/2B	5.0
201500405	Complex function theory	Q4/2B	3.0
191154731	Computational Fluid Dynamics	Q4/2B	5.0
201400300	Multiphase Flows	Q4/2B	5.0
201800131	Numerical methods for engineers	Q4/2B	5.0
201700024	Wind Energy	Q4/2B	5.0

Materials, Science and Engineering			
<i>Master programmes: Applied Physics, Chemical Science and Engineering, Mechanical Engineering</i>			
Course code	Name	Planning	EC
193700010	Characterization	Q1/1A	5.0
193700040	Inorganic Materials Science	Q3/2A	5.0
193550020	Surfaces and Thin Layers	Q3/2A	5.0
202100319	Phase transformations in manufacturing	Q4/2B	5.0