Assessment plan for the curriculum of the **Bachelor's** degree programme in Physics, 2024-2025

Programme director: D. Roest

Date advice Board of Examiners: June 21, 2024

Date approval Faculty Board:

1. Vision on assessment

Objectives
The vision behind the Bachelor's degree programme in Physics is to organize and facilitate the teaching and training of the next generation of ambitious physicists. Its aim is to offer students a solid foundation to explore the boundaries of our understanding of the fundamental workings of nature. This is done by providing them with profound knowledge of general physics subjects, as well as more specialized ones and those at the interface with adjacent disciplines; by training them in performing scientific research; and by providing them with general academic skills. Independent and critical thinking, an open mind, problem solving eagerness, skills in clear writing and exposition, and a dedication to physics both as an academic discipline and as a field that has strong connections to adjacent scientific disciplines and societal developments – these are important general objectives of the programme.

Assessment vision statement:

- The assessment guides and evaluates student learning in a diverse manner, with a focus on knowledge of physical concepts as well as relevant skills including problem-solving, collaboration, scientific reasoning and experimental lab work.
- The assessment stimulates students to adopt an active learning stance and to learn from their mistakes, by combining formative aspects at various stages and a summative assessment.
- The assessment stimulates students to approach problems from a physics perspective that observes, models and explains physical processes, thereby preparing them for further study or career in related science disciplines.

2. Assessment guidelines

Guidelines for assessment quality:

- The BSc programme consists of 165 ECTS worth of courses and a 15 ECTS research project. There are four 10-ECTS courses in the first two years of the programme, all other courses are 5 ECTS.
- The programme offers a variety of different assessment methods, assessing different learning outcomes and skills. The course assessment scheme can be found on Brightspace and Ocasys from the start of the course, and cannot be changed during the course (unless given explicit permission by the Board of Examiners).

- The majority of courses are assessed with an individual, written exam at the end of the course. A number of these courses have intermediate assessment moments as well, consisting of e.g. midterm exams or homework assignments, that contribute a fraction to the final grade.
- The 10-ECTS courses in the first year of the programme have a practical assignment as well, that needs to be completed with a pass grade before the full course can be passed.
- To facilitate preparation by the students for the final exam, a mock exam (for example an exam from a previous year) must be available, at least two weeks prior to the exam.
- A clear and explicit answer key for the exam is drawn up by the course coordinator to ensure the transparency and fairness of the grading process.

- Most resits of these courses consist of a single, individual, written exam. The examiner can opt for an oral exam in case there are very few students attending a resit. These are graded using the dedicated oral exam grading form and an independent observer (preferably the preassigned second examiner) must be present during the full exam. At the beginning of the exam, the student should be informed of the topics to be examined.

- Next to the courses with individual assessment, the programme also contains courses that are based on group work, e.g. practical or project-based courses. In these cases, the course grade is determined by presentations of the students as well as the final report that is handed in.
- Clear and explicit rubrics are available that facilitate the grading of the project as well as the

feedback to students.

- The 15-ECTS research project at the end of the programme takes place in one of the research groups and supervised by an examiner of the programme.
- Regular progress meetings (at least every week) with the (daily) supervisor will take place, in which the student will be given feedback and instructions on the day-to-day research. Progress meetings (at least every four weeks) with the supervisor should take place, in which the students will be given clear feedback on their progress.
- The examiner should provide feedback on at least one full draft version of the thesis, provided the student meets the agreed deadline for handing in the full draft.
- To ensure standardized and fair grading, the project is assessed by the examiner and a second examiner from another research unit than the first supervisor.
- All written assignments must be checked for plagiarism before grading.
- All assessment and feedback, final and day-to-day, is provided in English to prepare students for further study and a future career with an international job market.

3. Learning outcomes of the degree programme

Learning Outcome:	
A. Generic learning outcomes - Knowledge	
A1	Bachelor's graduates have general knowledge of the foundations and history of mathematics, natural sciences and technology, in particular those of Physics.
A2	Bachelor's graduates have mastered the basic concepts of Physics (see Appendix 1 for further specification) and are familiar with the interrelationships of these concepts within their own discipline as well as with other disciplines.
A3	Bachelor's graduates have in-depth knowledge of several contemporary topics within Physics.
A4	Bachelor's graduates are familiar with the quantitative character of the fields of mathematics and natural sciences and have an understanding of the methods used in these fields, and particularly within Physics, including computer-aided methods.
A5	Bachelor's graduates have sufficient knowledge and understanding of mathematics and natural sciences to successfully complete a follow-up Master's degree programme in Physics.
A6	Bachelor's graduates are aware of the societal, ethical and social aspects involved in the fields of mathematics and natural sciences, and act accordingly.
B. Generic learning outcomes - Skills	
B1	(Research) Bachelor's graduates are able to draw up a research question, design, plan and conduct research and report on it independently with an appropriate degree of supervision. Bachelor's graduates are able to evaluate the value and limitations of their research and assess its applicability outside their own field.
B2	(Designing and Modeling) Bachelor's graduates are able to translate a physics problem into a plan of approach and – taking into account practical boundary conditions – find a solution.

B3	(Gathering information) Bachelor's graduates are able to gather relevant information using modern means of communication and to critically interpret this information.
B4	(Collaborating) Bachelor's graduates are able to collaborate in teams on technical-scientific problems.
B5	(Communicating) Bachelor's graduates are able to communicate orally and in writing in academic and professional contexts, with both colleagues and others. They are familiar with the relevant means of communication.
B6	(Reflecting) Bachelor's graduates are able to assess their own actions and those of others in a natural sciences context, bearing in mind the social/societal and ethical aspects.
B7	(Learning skills) Bachelor's graduates are able to apply learning skills that enable them to pursue a follow-up degree and acquire knowledge in new fields with a high level of autonomy.
B8	Additional subject-specific skills are listed in Appendix 2.
Appendix 1: Degree programme-specific learning outcomes - Basic Knowledge The Bachelor's graduate in Physics has:	
1.1	Knowledge of the most important subjects in the field of a) Classical and Relativistic Mechanics b) Electromagnetism c) Quantum Physics d) Thermodynamics e) Statistical Physics f) Wave phenomena, Oscillations and Optics g) Materials: structure and interactions h) Calculus and Linear Algebra
1.2	Knowledge of topics in at least one of the following research fields: a) Biophysics and Medical Physics b) Energy and Environmental Physics c) Nanophysics d) Particle Physics
1.3	Achieved in the Minor, a deeper knowledge of subjects within their own discipline or a broad general knowledge of a different discipline.
Appendix 2: Degree programme-specific learning outcomes - Skills The Bachelor's graduate in Physics is able to:	
2.1	estimate the orders of magnitude of various physical processes;
2.2	use specific software, such as a programming language or a (symbolic) software package;
2.3	setup and carry out an experiment, while taking into account the safety and environmental issues;
2.4	gain insight in the fundamental workings of nature through the analysis of experimental constructs and/or experimental data.

4. Overview of assessment methods, test moments for course units, and examiners

The abbreviations for the relevant teaching methods are explained in the legend of the table. Examples of assessment methods include:

- *Written Exam (WE)*
- *Multiple Choice (MC)*
- *Oral Exam (OR)*
- *Report (R)*
- *Presentation (P)*
- *Practical Work (PR)*
- *Assignment (AST)*

Year 1

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
1	1A	Calculus 1 (for Physics) (WBPH057-05)	5	AST, WE	Yes	continuous assessment, exam week	T.F. Görbe	H. Jardon Kojakhmetov
1	1B	Calculus 2 (for Physics) (WBPH058-05)	5	AST, WE	Yes	continuous assessment, exam week	T.F. Görbe	H. Waalkens
1	2A	Computational methods 1 (WBPH064-05)	5	AST, WE	Yes	continuous assessment	J. Slawinska	P.R. Onck
1	2	Electricity and Magnetism (WBPH033-10)	10	PR, WE	Yes	continuous assessment, exam week	M.S. Pchenitchnikov	J. Aalbers
1	2A	Linear Algebra (for Physics) (WBPH054-05)	5	AST, WE, PR	Yes	continuous assessment, exam week	M. Mendez	D. Boer
1	2B	Mathematical Physics (WBPH049-05)	5	AST, WE	Yes	continuous assessment, exam week	E. Dimastrogiovanni	TBD
1	1	Mechanics and Relativity (WBPH001-10)	10	MC, WE	Yes	continuous assessment, exam week	P.D. Meerburg	D. Roest
1	2B	Physics Lab: Research Project (WBPH076-05)	5	AST, P, R	Yes	continuous assessment, midterm, exam week	J.S. Blijleven	R.J.H. Klein-Douwel
1	1A	Physics Lab: Skills (WBPH077-05)	5	PR, WE, R	Yes	continuous assessment, exam week	J.S. Blijleven	R.J.H. Klein-Douwel

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
1	1B	Physics of Modern Technology (WBPH027-05)	5	WE, P	Yes		C.H. van der Wal	M.H. Diniz Guimaraes, A. Giuntoli
1	1B	Introduction to Astronomy (WBAS007-05)	5	AST, WE, IT	Yes		J. Noel-Storr	M.A.M. van de Weijgaert
1	1B	Introduction to Energy and Environment (WBPH019-05)	5	WE, IT	Yes		H.A.J. Meijer	TBD
1	1B	Introduction to Nanophysics (WBPH055-05)	5	WE, IT, P	Yes	continuous assessment, exam week	R. lo Conte	B. Noheda Pinuaga
1	1B	Physics of the Quantum Universe (WBPH028-05)	5	AST, MC, WE	No	continuous assessment, exam week	K.A.M. de Bruyn	D. Roest
1	1B	Medical Physics & Biophysics (WBPH022-05)	5	AST, P, WE	Yes		R. Vlijm	T. Schlathölter

Year 2

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
2	1A	Computational methods 2 (WBPH065-05)	5	AST	Yes	continuous assessment	M. Kavatsyuk	J.W. Brijan
2	2A	Fundamentals of Electronics (WBPH070-05)	5	AST, PR, WE	Yes		E. Chicca	J.S. Blijleven
2	2B	Physics Lab: Advanced Experiments 1 (WBPH074-05)	5	OR, R, PR	Yes	continuous assessment	M. Fontana	A.K. Biegun
2	2A	Subatomic physics: concepts and experiments (WBPH088-05)	5	WE, AST	Yes		J. Aalbers	A. Perrevoort
2	1A	Quantum Physics 1 (WBPH014-05)	5	AST, WE	Yes	continuous assessment, exam week	M.H. Diniz Guimaraes	D. Roest
2	1B	Quantum Physics 2 (WBPH052-05)	5	WE	Yes		E. Pallante	D. Boer
2	2	From Atoms to Solids (WBPH085-10)	10	WE	Yes		A. Borschevsky	T.A. Schlathölter
2	1	Thermal Physics (WBPH002-10)	10	WE	Yes	mid-term, exam week	G. Palasantzas	L.J.A. Koster
2	1B	Waves and Optics (WBPH032-05)	5	AST, R	Yes	continuous assessment	S. Hoekstra	A.K. Biegun
2	2B	Complex Analysis (for Physics) (WBPH059-05)	5	AST, WE	Yes		A. Mazumdar	O. Lorscheid
2	2B	Geo-energy (WBPH018-05)	5	WE	Yes	continuous assessment, exam week	J.M. Miocic	H.A.J. Meijer
2	2B	Biomaterials 1 (WBBE007-05)	5	MC, WE, P	Yes		P. van Rijn	P. Sharma

Year 3

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
Biophysics and Medical Physics (specialisation)								
3	2A	Cellular Chemistry (WBCH021-05)	5	WE, P	Yes		B. Poolman	P.J.M. van Haastert
3	2A	Physics and Technology of Medical Imaging (WBBE057-05)	5	AST, MC	Yes		M.J.W. Greuter	P.M.A. van Ooijen
3	1B	Introduction to Science Communication (WBEC001-05)	5	R	Yes		L.T.J. Kraan	H.A.J. Mulder, F.H.C.E. van der Graaf
3	1B	Modelling Life (WBBY024-05)	5	WE, AST	Yes		G.S. van Doorn,	B.M. Bakker, J. Bakker, A. Milias Argeitis, F.J. Weissing
3	1B	Organic Chemistry 1 (WBCH013-05)	5	WE	Yes		M.D. Witte	T. Kudernác
3	1B	Spectroscopic Tools for Life Sciences (WBLT017-05)	5	WE, AST	Yes	continuous assessment, exam week	R.M. Hildner	P.C.A. van der Wel
3	1B	Nanophysics and Nanotechnology (WBPH025-05)	5	AST, WE	Yes	continuous assessment, exam week	J. Slawinska	M.A. Loi
3	1B	Oriëntatie op Onderwijs in de Bètawetenschappen (WBEC002-05)	5	OR, R	Yes		J.E. van der Laan	G. Roorda, S. Tuenter
3	1B	Physics Lab: Advanced Experiments 2 (WBPH073-05)	5	OR, R, PR	Yes	continuous assessment	M. Fontana	A.K. Biegun
3	2A	Physics of Fluids (WBPH042-05)	5	WE	Yes		P.R. Onck	E. van der Giessen
3	2A	Principles of Measurement Systems (WBPH029-05)	5	AST, WE	Yes		A.K. Biegun	J.S. Blijleven
3	2B	Bachelor Research Project (WBPH903-15)	15	AST, PR, P, R	Yes	continuous assessment	See list examiners research projects below	

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
Energy and Environmental Physics (specialisation)								
3	2A	Air Pollution (WBPH035-05)	5	PR, R, WE	Yes	exam week	U. Dusek	H.A.J. Meijer
3	2A	Introduction to Energy Systems (WBPH084-05)	5	AST	Yes		A.A. van der Meer	A. Purushothaman Vellayani
3	1B	Introduction to Science Communication (WBEC001-05)	5	R	Yes		L.T.J. Kraan	H.A.J. Mulder, F.H.C.E. van der Graaf
3	1B	Oriëntatie op Onderwijs in de Bètawetenschappen (WBEC002-05)	5	OR, R	Yes		J.E. van der Laan	G. Roorda, S. Tuenter
3	1B	Atoms & Molecules (WBPH003-05)	5	AST, WE	Yes	continuous assessment	R. Hoekstra	A. Borschevsky
3	1B	Physics Lab: Advanced Experiments 2 (WBPH073-05)	5	OR, R, PR	Yes	continuous assessment	M. Fontana	A.K. Biegun
3	2A	Physics of Fluids (WBPH042-05)	5	WE	Yes		P.R. Onck	E. van der Giessen
3	1B	Principles of Measurement Systems (WBPH029-05)	5	AST, WE	Yes		A.K. Biegun	J.S. Blijleven
3	1B	Solar Cells (WBCH018-05)	5	WE, P, R	Yes		L.J.A. Koster	S.C. Veenstra
3	2B	Bachelor Research Project (WBPH903-15)	15	AST, PR, P, R	Yes	continuous assessment	See list examiners research projects below	
Nanophysics (specialisation)								
3	2A	Device Physics (WBPH037-05)	5	WE, P, R	Yes		B.J. van Wees	T. Banerjee, M.A. Loi
3	1B	Introduction to Science Communication (WBEC001-05)	5	R	Yes		L.T.J. Kraan	H.A.J. Mulder, F.H.C.E. van der Graaf
3	1B	Atoms & Molecules (WBPH003-05)	5	AST, WE	Yes	continuous assessment	R. Hoekstra	A. Borschevsky
3	2A	Materials Design: Theoretical Methods	5	AST, WE, R	Yes		A. Borschevsky	R.W.A. Havenith

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
		(WBCH024-05)						
3	1B	Nanophysics and Nanotechnology (WBPH025-05)	5	AST, WE	Yes		M.A. Loi	J. Slawinska
3	2A	Nanoprobing and Nanofabrication (WBPH041-05)	5	WE, R	Yes		T. Banerjee	A. Grubisic-Cabo
3	1B	Oriëntatie op Onderwijs in de Bètawetenschappen (WBEC002-05)	5	OR, R	Yes		J.E. van der Laan	G. Roorda, S. Tuenter
3	1B	Physics Lab: Advanced Experiments 2 (WBPH073-05)	5	OR, R, PR	Yes	continuous assessment	M. Fontana	A.K. Biegun
3	1B	Principles of Measurement Systems (WBPH029-05)	5	AST, WE	Yes		A.K. Biegun	J.S. Blijleven
3	1B	Solid State Physics (WBPH068-05)	5	AST, WE	Yes		J. Ye	M.A. Loi
3	2B	Bachelor Research Project (WBPH903-15)	15	AST, PR, P, R	Yes	continuous assessment	See list examiners research projects below	
Particle Physics (specialisation)								
3	1B	Advanced Mechanics (WBPH017-05)	5	AST, WE	Yes	continuous assessment, exam week	E. Dimastrogiovanni	E. van der Giessen
3	2A	Advanced Electrodynamics (WBPH079-05)	5	AST, WE	Yes		R.G.E. Timmermans	R. Klein
3	1B	Atoms & Molecules (WBPH003-05)	5	AST, WE	Yes	continuous assessment	R. Hoekstra	A. Borschevsky
3	2A	Experimental Particle Physics (WBPH040-05)	5	OR, PR, R	Yes		L. Willmann	M. Kavatsyuk
3	1B	Introduction to Science Communication (WBEC001-05)	5	R	Yes		L.T.J. Kraan	H.A.J. Mulder, F.H.C.E. van der Graaf
3	1B	Oriëntatie op Onderwijs in de Bètawetenschappen (WBEC002-05)	5	OR, R	Yes		J.E. van der Laan	G. Roorda, S. Tuenter

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
3	1B	Physics Lab: Advanced Experiments 2 (WBPH073-05)	5	OR, R, PR	Yes	continuous assessment	M. Fontana	A.K. Biegun
3	1B	Principles of Measurement Systems (WBPH029-05)	5	AST, WE	Yes		A.K. Biegun	J.S. Blijleven
3	2A	Relativistic Quantum Mechanics (WBPH045-05)	5	AST, WE	Yes		A. Mazumdar	D. Roest
3	1B	Particle Physics (WBPH081-05)	5	WE, AST	Yes	continuous assessment, exam week	A. Perrevoort	J. Aalbers
3	2A	Symmetry in Physics (WBPH047-05)	5	WE	Yes		D. Boer	A. Borschevsky
3	2B	Bachelor Research Project (WBPH903-15)	15	AST, PR, P, R	Yes	continuous assessment	*See list of examiners research projects below*	

Year 3 - Deepening minor: Quantum Materials & Radiation

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
3	1A	Cosmology (WBAS001-05)	5	WE	Yes		S. Zaroubi	M.A.M. van de Weijgaert
3	1A	Ionizing Radiation in Medicine (WBPH007-05)	5	AST, WE, P	Yes		T.A. Schlathölter	P.G. Dendooven
3	1A	Nuclear Energy (WBPH010-05)	5	AST, WE	No	continuous assessment	C. Rigollet	J. Even
3	1A	Nuclear Physics (WBPH011-05)	5	AST, WE	Yes		J. Even	C. Rigollet
3	1A	Optical Spectroscopy (WBPH078-05)	5	AST, WE	Yes	exam week	P.J. van der Zaag	R. Vlijm
3	1A	Physical and Chemical Kinetics (WBPH012-05)	5	WE	Yes		A.V. Mokhov	H.B. Levinsky
3	1A	Solid Mechanics (WBPH015-05)	5	WE	Yes		E. van der Giessen	F. Maresca

University Minor: Einstein's Physics: Space-time and Parallel Worlds

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
-	1A	Living in Einstein's Universe (WBPH060-05)	5	AST	Yes		R.G.E. Timmermans	D. van Eijk
-	1A	Relativity Theory (WBPH061-05)	5	AST, WE	No	exam week	D. van Eijk	D. Roest
-	1A	The Quantum World (WBPH062-05)	5	WE	Yes	continuous assessment	S. Hoekstra	R.G.E. Timmermans

Examiners for Bachelor's Research projects

VSI
Aalbers, dr. J.
Bergshoeff, prof.dr. E.A.
Bethlem, dr. H.L.
Boer, prof.dr. D.
Borschevsky, prof.dr. A.
Bruyn, dr. K.A.M. de
Dimastrogiovanni, dr. E.
Eijk, D. van
Even, dr. J.
Hoekstra, prof.dr. S.
Jones, dr. S.
Jungmann, prof.dr. K.H.K.J.
Mazumdar, prof.dr. A.
Meerburg, dr. D.
Mulder, dr. M.
Pallante, prof.dr. E.
Pellegrino, prof.dr. A.
Perrevoort, dr. A.
Roest, prof.dr. D.
Timmermans, prof.dr. R.G.E.
Willmann, dr. L.

Zernike Institute
Banerjee, prof.dr. T.
Giessen, prof.dr.ir. E. van der
Grubisic-Cabo, dr. A.
Hildner, prof.dr. R.M.
Jansen, dr. T.L.C.
Koster, prof. dr. L.J.A.
Lo Conto, dr, R.
Mostovoy, prof.dr. M.V.
Onck, prof.dr.ir. P.R.
Pchenitchnikov, prof.dr. M.S.
Roos, prof.dr. W.H.
Rudolf, prof.dr. P.
Schlathölter, dr. T.A.
Slawinska, dr. J.
Vlijm, dr. R.
Wal, prof.dr.ir. C.H. van der
Wees, prof.dr.ir. B.J. van
Wel, prof.dr. P.C.A. van der
Zaag, dr. P.J. van der

ESRIG
Dee, prof.dr. M.W.
Dusek, prof.dr. U.
Kalantar-Nayestanaki, prof.dr. N.
Kavatsyuk, dr. M.
Levinsky, prof. dr. H.B.
Meer, dr. A.A. van der
Meijer, prof.dr. H.A.J.
Miocic, dr. J.M.
Mokhov, dr. A.V.

Kapteyn Astronomical Institute
Vecchi, dr. M.

SSE *
Biegun, dr. A.K.
Blijleven, dr. J.S.
Brijan, dr. J.W.
Klein, dr. R.
Klein-Douwel, dr. R.H.J.
Rigollet, dr. C.E.
Simsek, dr, C.

An examiner for the Bachelor Research projects in Applied Physics, Astronomy, or Mathematics may also act as second supervisor for a Bachelor Research Project in Physics.

* Examiners from the SSE may only act as second examiner for a Bachelor Research Project.

5. Relationship between course units and details of the learning outcomes

Please note in the table below the course units per block in the programme. Indicate which learning outcomes are assessed in which courses by adding an X in the relevant cell. Please add extra rows if necessary.

An X means that the learning outcome is explicitly assessed (not merely addressed) in the course.

Year 1															
Learning outcomes	Mechanics and Relativity	Electricity and Magnetism	Physics Lab: Skills	Physics Lab: Research project	Computational methods 1	Physics of the Quantum Universe	Physics of Modern Technology	Introduction to Nanophysics	Energy and Environment	Medical Physics & Biophysics	Introduction to Astronomy	Calculus 1 (for Physics)	Linear Algebra (for Physics)	Calculus 2 (for Physics)	Mathematical Physics
A1	X	X				X	X	X	X	X	X	X	X	X	X
A2	X	X	X	X	X							X	X	X	X
A3						X	X	X	X	X	X				
A4	X	X	X	X	X							X	X	X	X
A5	X	X	X	X								X	X	X	X
A6			X	X		X	X	X	X	X	X				
B1		X		X	X										
B2				X	X										
B3				X	X	X	X	X	X	X	X				
B4		X	X	X		X	X	X	X	X	X				
B5		X		X	X	X	X	X	X	X	X				
B6						X		X							
B7					X										
1.1	X	X										X	X	X	X
1.2					X	X	X	X	X	X	X				
2.1	X		X	X	X	X	X	X	X	X	X				
2.2					X										
2.3			X	X	X										
2.4			X	X	X										

Year 2								
Learning outcomes	Computational methods 2	Quantum Physics 1	Thermal Physics	Waves and Optics	Fundamentals of Electronics	Subatomic Physics	Structure of Matter	Physics Lab: Advanced Experiments 1
A1		X	X	X		X	X	
A2		X	X	X	X	X	X	
A3								
A4	X				X			X
A5	X	X	X	X	X	X	X	X
A6								
B1				X				X
B2	X			X				
B3				X				X
B4	X			X	X			X
B5								X
B6	X			X				X
B7				X				X
1.1		X	X	X	X	X	X	X
1.2								
1.3								
2.1					X			X
2.2	X							
2.3				X	X			X
2.4								X

Track: Biophysics and Medical Physics	Year 2		Year 3												
Learning outcomes	Quantum Physics 2	Biomaterials 1	Minor	Physics Lab: Advanced Experiments 2	Imaging Techniques in Radiology 1	Nanophysics and Nanotechnology	Principles of Measurement Systems	Cellular Chemistry	Physics of Fluids	Modelling Life	Organic Chemistry 1	Spectroscopic Tools for Life Sciences	Oriënt. op Onderw. in de Bètawetenschappen	Introduction to Science Communication	Bachelor Research Project
A1	X								X						
A2	X	X			X	X	X	X	X	X	X	X			
A3		X			X	X		X		X	X		X	X	X
A4				X			X		X						X
A5	X			X			X		X						X
A6					X	X							X	X	X
B1				X									X	X	X
B2													X	X	X
B3				X									X	X	X
B4				X									X	X	X
B5				X									X	X	X
B6				X	X	X		X		X	X	X	X	X	X
B7				X									X	X	X
1.1	X			X											
1.2		X			X	X		X		X	X	X			X
1.3			X												
2.1				X			X		X						X
2.2															X
2.3				X											X
2.4				X			X								X

Track: Energy and Environmental Physics	**Year 2**		**Year 3**									
Learning outcomes	Geo-Energy	Quantum Physics 2	Minor	Physics Lab: Advanced Experiments 2	Air Pollution	Principles of Measurement Systems	Solar Cells	Introduction to Energy Systems	Physics of Fluids	Oriënt. op Onderw. in de Bètawetenschappen	Introduction to Science Communication	Bachelor Research Project
A1		X			X				X			
A2	X	X				X	X	X	X			
A3	X						X	X		X	X	X
A4	X			X	X	X		X	X			X
A5	X	X		X	X	X	X	X	X			X
A6	*X*				X		X	X		X	X	X
B1				X						X	X	X
B2										X	X	X
B3				X						X	X	X
B4				X						X	X	X
B5				X						X	X	X
B6	X			X	X		X	X		X	X	X
B7				X						X	X	X
1.1		X		X								
1.2	X				X		X	X				X
1.3			X									
2.1	X			X	X	X	X	X	X			X
2.2												X
2.3				X	X							X
2.4				X	X	X						X

Track: Nanophysics	Year 2		Year 3											
Learning outcomes	Complex Analysis (for Physics)	Quantum Physics 2	Minor	Nanoprobing and Nanofabrication	Materials Design: Theoretical Methods	Device Physics	Physics of Fluids	Nanophysics and Nanotechnology	Oriënt. op Onderw. in de Bètawetenschappen	Introduction to Science Communication	Physics Lab: Advanced Experiments 2	Principles of Measurement Systems	Solid State Physics	Bachelor Research Project
A1	X	X					X						X	
A2	X	X		X	X	X	X	X				X	X	
A3				X		X		X	X	X				X
A4					X		X				X	X		X
A5	X	X		X	X	X	X	X			X	X	X	X
A6									X	X				X
B1									X	X	X			X
B2					X				X	X				X
B3									X	X	X			X
B4									X	X	X			X
B5						X			X	X	X			X
B6									X	X	X			X
B7									X	X	X			X
1.1	X	X									X		X	
1.2				X		X		X						X
1.3			X											
2.1					X		X				X	X		X
2.2														X
2.3											X			X
2.4											X	X		X

Track: Particle Physics	Year 2		Year 3												
Learning outcomes	Complex Analysis (for Physics)	Quantum Physics 2	Minor	Advanced Electrodynamics	Symmetry in Physics	Particle Physics	Relativistic Quantum Mechanics	Advanced Mechanics	Chaos Theory	Experimental Particle Physics	Oriënt. op Onderw. in de Bètawetenschappen	Introduction to Science Communication	Physics Lab: Advanced Experiments 2	Principles of Measurement Systems	Bachelor Research Project
A1	X	X			X	X				X					
A2	X	X		X	X	X	X	X	X	X				X	
A3				X		X					X	X			X
A4					X		X	X	X				X	X	X
A5	X	X		X	X	X	X	X	X	X			X	X	X
A6											X	X			X
B1											X	X	X		X
B2											X	X			X
B3											X	X	X		X
B4											X	X	X		X
B5											X	X	X		X
B6											X	X	X		X
B7											X	X	X		X
1.1	X	X											X		
1.2				X	X	X	X	X	X	X					X
1.3			X												
2.1													X	X	X
2.2															X
2.3													X		X
2.4													X	X	X