

***Programme-specific appendix
to the programme part of the students' charter,
including the education and examination regulations
of the Applied Physics (AP) Master's Programme
as of 1 September 2022
(Article 7.13 and 7.59 WHW)***

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Preamble

1. The rules in this appendix apply to the full-time master's programme Applied Physics (No. 60436).
2. Together with the general section (TNW/22.801), this programme-specific appendix forms the programme section of the student charter including the Education and Examination Regulations for the master's programme Applied Physics of the faculty Science and Technology at the University of Twente.
3. The programme is subject to the legislation of the Dutch Higher Education and Research Act (WHW).
4. When reference is made to 'the (study) programme', 'the programme committee' or 'the board of examiners', it refers to the Master's programme Applied Physics, the programme committee or board of examiners of the Master's programme Applied Physics, respectively.

Reference: TNW/22.811
Date: 14 July 2022

Article 1 Programme Objective

Education within the study programme is designed to enable students to develop themselves optimally within the limits of their individual abilities and ambitions, but also in the role that society expects from them. The student profile that we strive for is characterised by the following aspects: independent, creative, problem-solving, authentic, reflective and critical. They are team players with a keen eye on their own role, but also the role and perspective of others. Ultimately, Applied Physics graduates should be aware of their responsibilities as academic professionals on the job market and in society.

Within the programme, we consider it essential that the education serves the individual learning needs of each student. In addition to a well-defined part of the curriculum, there is sufficient room for individual choices, both in width and depth. Sufficient flexibility enables us to design customised, personal study programmes, not only to optimise study duration but also to allow for extra-curricular activities, such as serving on a board or committee, participating in student teams, organization of events, study tours, etc. In that respect, we expect students to take responsibility for their own learning process. The learning process is primarily driven by the student's intrinsic motivation to develop within and outside the discipline. The role of staff and teachers is to facilitate as much as possible, as partners in the learning process. In that respect, we envisage students as our future colleagues.

Article 2 Intended Learning Outcomes

The intended learning outcomes for the study programme reflect our aim to educate independent, critically thinking academic professionals, who are equipped with competences to contribute to the field of engineering physics and to society as a whole. Below an overview is given of the intended learning outcomes of the master's, where we distinguish competences related to knowledge, skills, personal development, communication, and organization.

1. **Knowledge** – The Applied Physics graduate:
 - 1.1. has thorough technical and scientific knowledge of essential theories in the domain of (applied) physics and mathematics, and can relate to other disciplines in a multidisciplinary environment.
 - 1.2. has advanced knowledge and understanding and the ability to apply this knowledge to design and research within one or more sub-areas of the (applied) physics domain.
2. **Skills** – The Applied Physics graduate:
 - 2.1. has thorough can apply advanced mathematical, experimental and computational tools and methods to solve complex physics problems in a broad context.
 - 2.2. can apply the scientific research method and identify advanced physics problems in their full context.
 - 2.3. can identify, formulate and solve research or design problems in the field of (engineering) physics using a systematic approach.
 - 2.4. can apply the scientific design method, divide a design problem into different sub-problems, and can apply physics expertise to realise complex innovative solutions.
3. **Personal development** – The Applied Physics graduate:
 - 3.1. has is critical, self-thinking, and able to reflect on their own performance and personal responsibilities.
 - 3.2. is aware of the role of applied physics in science and society, and of the international orientation of the discipline.
 - 3.3. has experience with the possibilities on the labour market and in academia after completing the master's programme.
 - 3.4. can decide based on integrity and ethical norms in research and industrial environments and take responsibility in a local, national and international setting.
 - 3.5. can select, process and evaluate information from different sources.

4. **Communication** – The Applied Physics graduate:
 - 4.1. can effectively communicate with a variety of audiences to inform, influence and discuss using various techniques and language appropriate for the audience.
5. **Organisation** – The Applied Physics graduate:
 - 5.1. can organise, contribute to and complete a complex project, either individually or as part of a team by collaborating, taking the lead and being sensitive to inclusivity issues.
 - 5.2. has the attitude to learn and is able to maintain, improve and integrate new knowledge and academic skills into existing competences.
 - 5.3. can identify relevant competences for further development after completing the academic programme, and can link strengths and weaknesses to personal and professional development goals (lifelong learning).

Article 3 Admission Board

1. An admission board is appointed by the dean of the faculty of Science and Technology for the admission to the programme of students who are not directly admissible in accordance with article 4.2a of this appendix.
2. The executive board has delegated the authority to accept or reject students (decision reference: S&C/387.191/lk) to the board mentioned under section 1.
3. The admission board is chaired by the programme director. In case of foreign students or students with a qualification in higher professional education respectively the internationalization coordinator or the higher professional coordinator is a member of the admission board.
If the chair deems it necessary, the secretary of the board of examiners and/or the study adviser can join the admission board.

Article 4 Admission to the Programme

1. The programme has two intake moments: the first Monday in September and the first Monday in February.
2. Direct admission to the programme is granted to students who possess:
 - a. a degree in one of the bachelor's programmes in Applied Physics or Physics at a Dutch university, or
 - b. a proof of admission to the programme, issued by the admission board.
3. During assessment of the application for admission to the programme, the admission board can demand that some subjects must be passed before the proof of admission can be issued.
4. When a proof of admission is issued, the admission board may decide to grant exemption for particular parts of the programme, with exception of the final master's assignment.
5. A proof of admission to the programme issued by the admission board may impose conditions on the specific content of the student's programme.
6. The decisions of the admission board in sections 4 and 5 of this article require the approval of the board of examiners.
7. The following applies for students with a qualification in higher professional education (University of Applied Sciences; hbo) in Applied Physics or Electrical Engineering:
 - a. They can be admitted to a transfer programme of 30 EC,
 - b. The transfer programme is compiled by the programme director. More detailed information can be found on the website of the programme (www.utwente.nl/ap).
 - c. Students must complete the transfer programme within a period of 1 year and will be given two opportunities to take the exam. The courses must be completed with a minimum grade of 6.0
 - d. After completion of the transfer programme, the candidates can be admitted to the programme. The programme for students with a qualification in higher professional education in Applied Physics or Electrical Engineering is defined in article 6 of this programme-specific appendix.
8. Students in possession of a bachelor's degree in Applied Mathematics (AM), Advanced Technology (AT), Biomedical Technology (BMT), Chemical Science and Technology (CSE), Electrical Engineering (EE), Mechanical Engineering (ME), Technical Medicine (TM) or University College Twente (UCT) may be admitted to the regular master's programme if their bachelor's programme meets the conditions specified in article 8 of this programme-specific appendix¹.
9. Students with a previous education at a foreign institution must demonstrably have sufficient language skills in spoken and written English. A requirement for their admittance to the programme may be a sufficient score in a recognized test.² Students in possession of a bachelor's degree from a country where English is the main language in higher education³ are exempt from this requirement.

¹ This applies for programmes at the University of Twente, but also to equivalent programmes at other Dutch universities.

² See the UT website on admittance to the master's programmes: <https://www.utwente.nl/en/education/master/admission-requirements/international-degree>

³ The list of countries can be found at <https://www.utwente.nl/en/education/master/admission-requirements/international-degree/countries>

Article 5 General Master's Curriculum

The curriculum consists of:

- 5 compulsory courses (20 EC) in the first year;
- 20 EC specialization courses⁴;
- 10 EC elective courses at master level within the technical or physics domain;
- 10 EC free electives⁵;
- An external internship of 20 or 30 EC; If the 30 EC internship is chosen then the elective courses are reduced by 10 EC;
- A final master's assignment of 40 EC.

The curriculum contains a list of recommended (elective) courses for each Applied Physics chair.

Capita Selecta courses can be used for activities done for a chair that are not part of regular courses. The contents, method and scope are determined by the chair. For this purpose, a [registration form](#) must be completed, on which the course code, name, amount of EC's as well as the subject, material used, the assessment and the title are recorded.

A student, who has already passed one or more compulsory courses of the curriculum during the bachelor's degree or has passed courses that can be approved as an elective course in the master's programme, can be exempted for these courses. The student does not receive a reduction in the total amount of EC's that has to be passed in the master's programme. These EC's must be filled with elective courses at a master's level within the technical or physics domain.

The study programme must be approved by the graduation professor and the board of examiners. The graduation professor approves when the study programme is compiled in accordance with the conditions of the master's curriculum.

The final master's assignment is assessed with two grades: One for physics aspects, and one for general aspects. The physics aspects include theoretical insight, experimental skills, problem-solving capability and originality, and scientific relevance in terms of physics and/or technology. The general aspects comprise independence, commitment, ability to collaborate, creativity, level of the presentation and the final report, and accessibility and usability of the results.

First and second year (M1 en M2)		
Course code	Name	EC
M1		
Compulsory courses (20 EC)		
202200093	Quantum Mechanics 2	5
201900080	Mathematical and Numerical Physics	5
191470241	Heat and Mass Transfer	5
201900282	Small Signals and Detection	4
201900281	Ethical and Cultural Awareness	1
Specialization courses (20 EC)		20
Elective courses physics/technical		10
Elective courses free		10/0
M2		
Internship, 193599010 / 201700185		20/30
Master's Assignment, General Aspects 201800345 / Physics Aspects 201800344		40
Total master		120

⁴ The specialization courses depend on the chair in which the final assignment is done. See [Curriculum Applied Physics](#).

⁵ The free electives should be filled with specialization courses of other chairs from the Applied Physics programme, courses of other master's programmes (see websites of the other programmes) and/or extra Applied Physics courses.

Article 6 Curriculum for Students with a Qualification in Higher Professional Education

The standard curriculum for students with a qualification in higher professional education (University of Applied Sciences; hbo) in Physics or Electrical Engineering is summarized in the table below.

The study programme must be approved by the graduation professor and the board of examiners. The graduation professor approves when the study programme is compiled in accordance with the conditions of the master's curriculum.

First and second year (M1 en M2)		
Course code	Name	EC
Homologation physics courses (31 EC)		
202200095	Hilbert Space	3
202000682	Elektriciteit en Magnetisme	5
202000703	Partial Differential Equations	2
202000702	Statistical Physics	6
202000706	Electrodynamics	6
202000705	Fluid Physics	7
202000707	Numerical Methods for PDE	2
Compulsory master courses (20 EC)		
202200093	Quantum Mechanics 2	5
201900080	Mathematical and Numerical Physics	5
191470241	Heat and Mass Transfer	5
201900282	Small Signals and Detection	4
201900281	Ethics and Cultural Awareness	1
Specialization courses (20 EC)⁶		
Elective courses physics/technical (9 EC)		
Master's Assignment (40 EC)		
201800344	Master's Assignment Physics Aspects	20
201800345	Master's Assignment General Aspects	20
Total master		120

⁶ The specialisation courses for every chair in Applied Physics are listed in the [Curriculum Applied Physics](#).

Article 7 Standard Curriculum for Double Master's Programme

A double master's programme is a combination of two separate master's programmes, which the student follows in parallel and involves a combined final master's project and a combined internship.

The standard curriculum combining two masters 1 and 2 is summarized in the table below.

To comply with requirements of the other master's programme, deviations from this curriculum may be required.

The study programme must be approved by the graduation professor and the board of examiners. The graduation professor approves when the study programme is compiled in accordance with the conditions of the master's curriculum.

General set up for double master programme (180 EC)
30-45 EC Compulsory courses Master 1 ¹
30-45 EC Compulsory courses Master 2 ¹
30 EC Combined Internship
60 EC Combined Master Assignment
0-30 EC Elective courses ^{2,3}
¹ Courses part of both compulsory master programmes are placed in the most appropriate programme.
² The study programme may contain a maximum of 15 ECs of homologation courses at bachelor level.
³ The electives can be used to do separate internships

Article 7a Master's Programme with First-Degree Teaching Qualification

A student can obtain a first-degree teaching qualification in Physics by enrolling in the Dutch taught master's programme 'Science Education and Communication' (SEC). There are also several options to combine a master's programme Applied Physics with a first-degree teaching qualification in Physics:

1. For students without a second-degree teaching qualification in Physics, the double master's programme comprises a total of 180 EC, consisting of a combination of the 120 EC M-AP curriculum (article 5) and a 60 EC educational part of the first-degree teaching programme. The internship (20 EC) and free electives (10 EC) of the M-AP curriculum can be used for the educational part resulting in a 150 EC double master's programme.
2. For students with a second-degree teaching qualification in Physics, the double master's programme comprises a total of 150 EC, consisting of a combination of the 120 EC M-AP curriculum and a 30 EC educational part (due to a 30EC exemption) of the first-degree teaching programme.
3. Students with a second-degree teaching qualification in Physics can obtain their first-degree teaching qualification by using the internship (20 EC) and free electives (10 EC) in the M-AP curriculum for the 30 EC educational part. This does not lead to two master's degrees.

In all three cases, the student receives a master's degree in Applied Physics, including a first-degree teaching qualification. The content of the various programmes can be found on the website of the programme: www.utwente.nl/ap/

The study programme must be approved by the graduation professor and the board of examiners. The graduation professor approves when the study programme is compiled in accordance with the conditions of the master's curriculum.

Article 8 Admission Requirements for BSc AM/AT/BMT/CSE/EE/ME/TM/UCT students

Students with a bachelor's degree in various programmes listed in the table below must complete the indicated courses to be admitted to the master's programme Applied Physics:

Course code	Name	Module	EC	Language	AM	AT	BMT	CSE	EE	ME	TM	UCT
202000682	Electromagnetism	TN3	5	EN				x		x	x	x
202000683	Instrumentatie, or Basic Elect. and Instru.	TN3	4	NL				x		x	x	x ⁷
202000624		AT4	4	EN								
202000684	Analytical Progr.	TN3	1	EN				x		x	x	x
202000660	Intro SSP, or Inl Vastestoffysica	AT9	5	EN	x	x	x	x	x	x	x	x ⁷
202000701		TN7	7	TN								
202000661	Statistical Physics, or Statistische Fysica	AT9	5	EN	x	x	x	x	x	x	x	x
202000702		TN7	6	NL								
202200094	Quantum Mechanics 1	TN6	5	EN	x	x	x	x	x	x	x	x
202200095	Hilbert Space	TN6	3	EN		x	x	x	x	x	x	x
202000706	Electrodynamics ⁸	TN8	6	EN	x	x	x	x		x	x	x
202000697	Optics, or Physics of Fluids	TN6	7	EN	x	x	x		x	x	x	x ⁷
202000705		TN8	7	EN								

Depending on the specialization in the M-AP programme, other courses can be added in consultation with the study adviser.

Article 9 Safety

Working in a laboratory is subject to safety requirements. Students must acquaint themselves with these rules⁹ and abide by them.

Article 10 Sequence of Study Units

1. Prior to starting a study unit, the student must meet the knowledge requirements of the study unit.
2. The student can only start the final master's assignment when he/she has successfully completed at least 50 EC of the M1 master's curriculum.
3. Prior to the final examination, the student must have successfully completed all other study units.
4. The programme director is authorized, after consultation with the board of examiners, to grant exemption from the conditions in sections 1 to 3 of this article if strict application of those terms would result in an unreasonable delay in study progress. The student can submit a request to this end to the programme director.

Article 11 Flexible Degree Programme

Contrary to the provisions in article 5, 6, 7 and 7a of this appendix the student can request permission of the board of examiners to compose a flexible degree programme in the sense of article 7.3h of the Higher education and Research Act (WHW). The board of examiners assesses whether the programme fits within the Applied Physics domain, is coherent and whether the level is sufficient in terms of the programme intended learning outcomes.

Article 12 Student guidance

1. The task of the study adviser is to individually advise students on their studies, and to inform the

⁷ For UCT students, a basic Lab course is mandatory to participate in one of the lab courses required for admission to the M-AP programme.

⁸ Electrodynamics is not necessary for admission to the M-AP programme. When this course is not a part of the bachelor programme, it will be a compulsory course of the M-AP programme.

⁹ See the rules on occupational health and safety and the environment, at <http://www.utwente.nl/tnw/intra/diensten/amh/> and the information of the Laboratory Group of the Faculty of Science and Technology, at <http://www.utwente.nl/tnw/slt/>.

programme director on the study progress of the students.

2. Once a graduation chair has been selected, the daily supervisor, in consultation with the professor, will monitor the student's progress and maintains contact with the programme director and/or the study adviser.

Article 13 Quality Assurance and Evaluation

1. Quality assurance is the total of all activities and processes that a study programme organizes to ensure, evaluate, improve and justify the quality of education in a structural manner, with the aim that education is carried out with the predetermined (intended) quality.
2. The programme director is responsible for the quality of the content and the structure and organisation of the study programme, including the organisation and execution of quality assurance such as the evaluation of the programme.
3. The quality assurance is coordinated by the quality assurance coordinator of the Science & Technology faculty, cluster Science. The quality assurance coordinator advises the programme (staff) on the internal quality assurance.
4. The execution of the evaluation of the programme is done using PDCA¹⁰ procedures. The Quality Assurance Committee (QAC) of Applied Physics supports in the execution.
5. The following evaluation tools are used:
 - a. Panel meetings with students;
 - b. Surveys of the master's courses¹¹;
 - c. Survey of the final master's assignment.
6. The outcomes of the internal quality assurance activities are published in the following manner:
 - a. Summary of the surveys and response of the lecturers regarding the evaluation are shared with the programme committee;
 - b. Summary of surveys and the response of the lecturer are placed in the Canvas course 'TN/AP Quality assurance and evaluation' which is accessible for all students and lecturers of the programme.
7. To evaluate the curriculum and the programme as a whole, the following internal and external evaluations are used:
 - a. The exit survey about the entire programme;
 - b. The National Student Survey (NSE)¹²;
 - c. The National Alumni Survey (NAE)¹³;
 - d. Panel meetings.

The programme director responds to the evaluations and provides a plan for improvement. The evaluations including the plan for improvement are presented to the programme committee.
8. The programme director draws up an annual improvement plan, based on internal and external evaluations as well as on new insights.
 - a. The improvement plan is discussed with the programme committee;
 - b. The improvement plan is included in the faculty's annual report;
 - c. The faculty's annual report is discussed with the executive board by the dean and the portfolio holder education.

¹⁰ PDCA: Plan-Do-Check-Act

¹¹ Compulsory master courses are evaluated annually; other master courses are not evaluation each year. Intended is a frequency of at least once every three years.

¹² The NSE is taken annually.

¹³ The NAE is taken annually.

Article 14 Changes and transitional arrangements

1. In case of amendments to the programme-specific appendix, the conditions in article 8.3 and 8.4 of the general section apply.
2. In the event of a change to the programmes included in article 5, 6, 7 and 7a in this appendix, or of a change to one of the other articles included in the general section or in this programme-specific appendix, a transition arrangement will be defined and announced by the programme director.
3. Article 8.4 of the general section states the conditions to be met by a transition arrangement.
4. The transition arrangement will be published on the website of the programme.

Article 15 Effectuation

These regulations will come into effect on 1 September 2022 and replace the regulations dated 1 September 2021.

Established by the board of the Faculty Science & Technology, after advice from the Faculty Council and the Programme Committee Applied Physics and after consent of the Programme Committee Applied Physics with articles 2, 5, 6, 7, 7a, 9 and 13.

Enschede, 14 July 2022.