TEACHING AND EXAMINATION REGULATIONS

2022-2023

Appendix - Programme Specifics

MASTER OF SCIENCE
APPLIED PHYSICS

DELFT UNIVERSITY OF TECHNOLOGY

Administrative data

Nomenclature in CROHO	**MSc Applied Physics**
CROHO registration number	**60436**
Orientation and level of the programme	**Higher education, Academic Master level**
Number of credits	**120 ec, 2 years**
Mode(s) of study	**Fulltime**
NVAO accreditation	**Positive (March 4, 2022)**

https://www.nvao.net/nl/besluiten/technische-universiteit-delft/m-applied-physics

THIS DOCUMENT

The implementation regulations in this document apply to the teaching and the examinations related to the Master's degree programme in Applied Physics. This document is part of the Teaching and Examination Regulations.

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Article 1 – Admission to the programme **(TER art. 3)**

Individuals holding one of the following degrees have access to the education of the Master's degree programme on the condition that all of the stated requirements have been met. Students who want to start the programme as a second Master's degree programme must also submit a convincing motivation letter.

1. Students in possession of a Bachelor of Science degree in Applied Physics from Delft University of Technology will be admitted to the Master's programme.

2. Students who do not possess a degree mentioned in paragraph 1 are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admissions officer on this matter.
   In order to obtain proof of admission, the student must meet or, as the case may be, possess:
   a. The general relevant criteria set by the executive board in the "Policy on fees and enrolment", laid down in Appendix 1 of the Student Charter, and clarified in Part 1.2 "Entrance and admission" of the mentioned Student Charter. The Dutch language requirements for students admitted to a bridging programme stated in Article 3.1 of the TER do not apply if a customized bridging programme that is equivalent in content and level to the regular programme can be offered to non-Dutch speaking students living/studying in the Netherlands at the time of their application.
   b. A degree certificate, together with the accompanying list of marks, proving that he/she possesses knowledge of a sufficiently high level and broad scope to successfully complete the Master's programme within the allotted period of two years.

3. Students in possession of a Bachelor of Science degree in Applied Physics or in Physics (or equivalent in level and content) from a Dutch university will be admitted to the Master's programme, provided that they fulfil the following requirements:
   - BSc has been completed within at most five years;
   - Cumulative Grade Point Average ≥ 7.0.

   If standard physics courses are missing from the student's Bachelor programme, homologation courses may be assigned as a condition for admission.

4. Students in possession of a Bachelor of Science degree in Aerospace Engineering, Applied Earth Sciences, Applied Mathematics, Electrical Engineering, Mechanical Engineering, Molecular Science and Technology, or Nanobiology from Delft University of Technology, admitted to and having passed the TU Delft Applied Physics bridging (minor) programme within the allotted period will be admitted to the Master's programme.
   Students will be admitted to the bridging programme, provided that they fulfil the following requirements:
   - Study delay at the time of admission to the bridging programme is limited to a maximum of 1 year;
   - Cumulative Grade Point Average ≥ 7.0.

5. Students in possession of a Bachelor degree in Applied Physics from a Dutch university of Applied Sciences (HBO), admitted to and having passed the TU Delft Applied Physics bridging (minor) programme within the allotted period will be admitted to the Master's programme.
   Students will be admitted to the bridging programme, provided that they fulfil the following requirements:
   - No delay of studies (without good reason);
   - Cumulative Grade Point Average ≥ 7.5;
   - The demands on the level of English language mentioned in the Student Charter.

   Notwithstanding the general relevant criteria set by the executive board, laid down in Part 1.2 "Entrance and admission" and appendix 1 "Policy on fees and enrolment" of the Student Charter, students holding a HBO Bachelor degree in Applied Physics are <u>not</u> obliged to do a preliminary exam 'VWO wiskunde B'.

6. Students in possession of a Bachelor of Science degree in (Applied) Physics or equivalent from a foreign university can be admitted to the Master's programme provided that they fulfil the following requirements:
   - No delay of studies (without good reason);
   - Cumulative Grade Point Average ≥ 7.5 (guideline, specific requirements concerning the CGPA apply to certain countries. These countries and their requirements are posted on the TU Delft website);
   - Average grade for core courses ≥ 7.5 (guideline, as above);
   - The demands on the level of English language mentioned in the Student Charter.

Article 2 – Goal of the programme **(TER art. 5.1)**

The programme is intended to educate students to earn a Master of Science degree in Applied Physics, providing them with a level of knowledge, insight and skills that enable them to perform independent professional and scientific activities in the area of Applied Physics at the level of a Master of Science.

Article 3 – The programme's final attainment levels (TER art. 5.2)

In addition to the general attainment levels described in article 5.2, MSc Applied Physics graduates should possess the following competences:

1. **Applied Physics knowledge.** Mastery of Applied Physics at an advanced academic level. This means mastery of a choice of advanced general physics subjects (such as Quantum Mechanics, Statistical Physics, Electrodynamics, Continuum Physics) and the necessary mathematics, in addition to a choice of applied physics subjects (such as Quantum Electronics, Optics and Lasers, Fluid Dynamics, Reactor Physics) and optionally other advanced technical subjects (such as Computer Science, Materials Science, Chemistry, Life Sciences), as well as skills in the field of experimental techniques, data analysis, simulation and modelling. This knowledge and these skills should be mastered at a level comparable to that of Applied Physics programmes at international, top-quality, educational institutions.
2. **In-depth knowledge.** In-depth knowledge of at least one area within Applied Physics, so that international research literature can be understood.
3. **Research experience.** Capable of carrying out research in (Applied) Physics and aware of the applicability of research in technological developments.
4. **From abstraction to solution.** Capable of understanding a wide variety of different problems and being able to formulate these at an abstract level, whilst being able to see the relation between diverse problems at this abstract level and to contribute creatively to their solution, focusing on practical applications.
5. **Design.** Capable of creating innovative technical designs, taking feasibility issues into account.
6. **Collaboration/communication.** Capable of working in a possibly interdisciplinary team of experts, dealing comfortably with diversity, and communicating easily in both written and spoken English.
7. **Working independently.** Capable of carrying out a (research) project, including planning and time management. Working independently and taking initiatives where necessary.
8. **Presentation skills.** Capable of preparing and delivering physics research presentations in English, adapted to the background and interest of the audience.
9. **Societal awareness.** Knowledge of technology-related developments in society, such as sustainability issues. Capable of developing and defending opinions in this area.
10. **Responsibility.** Working safely and ethically responsibly, respecting scientific integrity.

Article 4 – Structure of the programme (TER art. 6)

1. The Applied Physics programme is a two-year MSc programme and comprises 120 EC. The programme has a core-orientation structure. Within this structure, there is a choice of research tracks. The core programme comprises 90 EC and has the same structure for all students. Combining the core programme with a 30 EC orientation completes the programme.

2. **Tracks.** The tracks within the Applied Physics core programme are:
   - Physics for Energy,
   - Physics for Fluids Engineering,
   - Physics for Health and Life,
   - Physics for Instrumentation,
   - Physics for Quantum Devices and Quantum Computing.

3. **Orientations.** Four orientations of 30 EC each can be chosen:
   - Research and Development (R&D),
   - Education (Ed1/Ed2),
   - Management of Technology (MoT),
   - Study Abroad (SA).

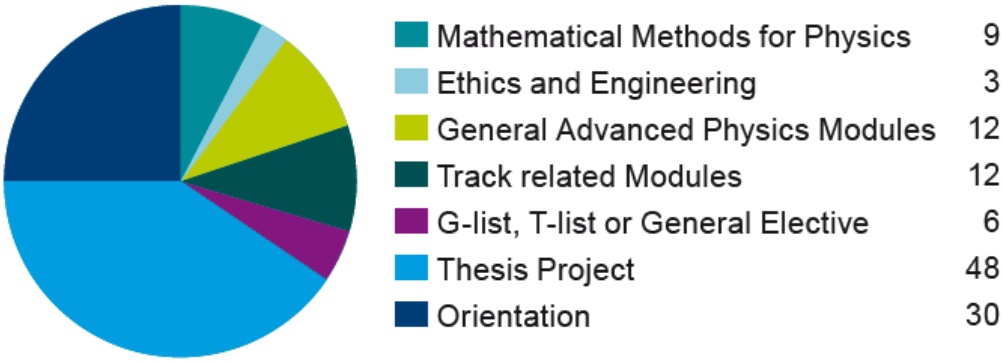
4. **Special programmes.** Special programmes within the MSc Applied Physics are:
   - Casimir pre-PhD programme. This programme focuses on preparing and educating students for a PhD position within the Leiden Institute of Physics, the Kavli Institute of Nanoscience in Delft, or elsewhere.
   - Delft Jena special programme on Photonics. In this programme, fitting within the Physics for Instrumentation track, students do the second year of the programme, including the thesis project, at the Abbe Center of Photonics of the Friedrich-Schiller-Universität in Jena.

5. **Programme additions.**
   - Honours programme. This is an additional individual challenging programme for students with a better than average performance in their MSc programme (>7.5 weighted average and no study delay).
   - Double degree programmes. These are three year programmes: Applied Physics – Management of Technology, Applied Physics – Applied Mathematics, or an individually approved combination of Applied Physics with another MSc programme.

Article 5 – Composition of the programme. **(TER art. 7.5)**

The courses of the degree programme are listed in this article, along with their study load. The number of contact hours and the form of examination of each course, as well as the programming of the examinations and the actual design of the education are elaborated in the study guide.

5.1 The core programme comprises 90 ec and has the same structure for all tracks and students:



5.1.1 Master Thesis Project, 48 EC

The Applied Physics core programme includes the Master Thesis Project

AP3902, Master Thesis, 48EC

The topic of the Thesis Project (6ec thesis preparation, 42ec thesis work) is related to the graduation track and is done in a research section of one of the departments of the faculty of Applied Sciences, in QuTech, or in an affiliated group.

Affiliated groups are:
For Physics for Fluids Engineering: Clouds & Climate group (CiTG), Fluid Mechanics section (3mE), Multiphase Systems section (3mE);
For Physics for Instrumentation: Centre for Systems and Control - Numerics for Control & Identification / Optics group (3mE), Dynamics of Micro and Nanosystems section (3mE), Experimental Astronomy Group (EEMCS), and Nikhef lecturers teaching in our programme.

The prior approval of the Board of Examiners should be obtained if the thesis work is performed outside the mentioned departments or affiliated groups.
For the Casimir pre-PhD programme, the Thesis Project has a different structure; see 5.3.1.
Regulations governing the Master Thesis projects are stated in article 7.3.

5.1.2 Obligatory Modules, 12 EC

The Applied Physics core programme includes compulsory math and ethics modules.

AP3001, Mathematical Methods for Physics, 9EC
WM0320TU, Ethics and Engineering, 3EC

Students that have passed the Partial Differential Equation module AM2070, TW2070, WI2607 or WI3150TU+WI3151TU/ WI4150TU in their bachelor's programme, e.g. as part of their minor, have two options with respect to AP3001:
1: Complete the three parts of AP3001, including the PDE part.
2: Voluntary skip the PDE part of AP3001 and choose a different MSc-level course of at least 3EC (either an Applied Physics course, a math course, or another course).

Students that have passed the Complex Analysis module AM2070, TW2040, WI2602 or EE2M11 in their bachelor's programme, have two options with respect to AP3001:
1: Complete the three parts of AP3001, including the Complex Analysis part.
2: Voluntary skip the Complex Analysis part of AP3001 and choose a different MSc-level course of at least 3EC (either an Applied Physics course, a math course, or another course).

It isn't possible to get an exemption in the master programme based on courses passed in a bachelor programme without doing an alternative master course module (Teaching and Examination Regulations, article 7.3).

5.1.3 General Advanced Physics Modules (G-list): 12 EC

The advanced physics modules aim at breadth as well as depth in general physics knowledge, following on from the Bachelor's programme. At least two modules must be chosen from this list:

AP3021, Advanced Statistical Mechanics, 6EC
AP3032, Continuum Physics, 6EC
AP3051, Advanced Quantum Mechanics, 6EC
AP3071, Advanced Electrodynamics, 6EC

5.1.4 Track related Modules (T-list): 12 EC

T-list modules are more specialised than G-list modules. They are technical and science subjects relating to and recommended for at least one of the tracks. The student should take at least 12 EC from the T-list of the track of his or her choice.

a. Physics for Energy:

AP3082, Computational Physics, 6EC
AP3141, Environmental Physics, 6EC
AP3211, Advanced Solid State Physics, 6EC
AP3271, Molecular Electronics, 6EC
AP3311, Neutrons, X-Rays and Positrons for Studying Microscopic Structures and Dynamics, 6EC
AP3333, Physics of Energy Materials, 6EC
AP3341, Nuclear Reactor Physics, 6EC
AP3352, Introduction to Nuclear Science and Engineering, 6EC
AE4W02TU, Introduction to Wind Turbines: Physics and Technology, 4EC
CH3322, Energy Storage in Batteries, 4EC
CH3632, Chemistry and Physics of Solar Cells, 6EC
CH3672, Computational Materials Science, 3EC
CH3783, Materials Chemistry for the Nuclear Fuel Cycle, 3EC
ME45203, Electrochemical Energy Storage 2: Analytical Modelling, 4EC

b. Physics for Fluids Engineering:

AP3082, Computational Physics, 6EC
AP3141, Environmental Physics, 6EC
AP3171, Advanced Physical Transport Phenomena, 6EC
AP3181, Applied Multiphase Flow, 6EC
AP3551, Computational Multiphase Flow, 6EC
AP3563, Water in the Atmosphere, 5EC
AE4180, Flow Measurement Techniques, 3EC
AE4W02TU, Introduction to Wind Turbines: Physics and Technology, 4EC
CH3051, Applied Transport Phenomena, 4EC
CH3153, Molecular Transport Phenomena, 4EC
CH3412, Biological Transport Phenomena, 4EC
CH3421, Computational Transport Phenomena, 6EC
ME45000, Advanced Heat Transfer, 3EC
ME45030, Turbulence, 5EC
ME45043, Advanced Fluid Dynamics for AP, 6EC (or ME45042, 5EC)
ME45190, Chaos in Dynamical Systems, 3EC
WI4011, Computational Fluid Dynamics, 6EC

c. Physics for Health and Life:

AP3061, Acoustic, Elastic and Electromagnetic Waves, 6EC
AP3082, Computational Physics, 6EC
AP3122, Advanced Optical Imaging, 6EC
AP3132, Advanced Digital Image Processing, 6EC
AP3162, Physics of Biological Systems: Mathematical modelling in Systems Biology, 6EC
AP3232, Medical Imaging Signals and Systems, 6EC
AP3352, Introduction to Nuclear Science and Engineering, 6EC

AP3371, Radiological Health Physics, 6EC
AP3511, Biophysics, 6EC (combined with NB4070)
AP3531, Acoustical Imaging, 6EC
AP3582, Medical Physics of Photon and Proton Therapy, 6EC
CH3412, Biological Transport Phenomena, 4EC
CH3763, Nuclear Medicine, 3EC
CH3771, Nuclear Chemistry, 6EC
NB4020, High Resolution Imaging, 4EC
NB4070, Soft Matter, 6EC (combined with AP3511)
NB4150, The Origin and Synthesis of Life, 6EC
NB4160, Engineering of Living Systems, 3EC

d. Physics for Instrumentation:

AP3061, Acoustic, Elastic and Electromagnetic Waves, 6EC
AP3082, Computational Physics, 6EC
AP3091, Elementary Particles, 6EC
AP3113, Quantum Optics, 6EC
AP3122, Advanced Optical Imaging, 6EC
AP3132, Advanced Digital Image Processing, 6EC
AP3152, Optics for Lithography, 6EC
AP3222, Nanotechnology, 6EC
AP3243, Lasers and Photodetectors, 3EC
AP3252, Electron Microscopy Characterization of the Nanoscale, 3EC
AP3311, Neutrons, X-Rays and Positrons for Studying Microscopic Structures and Dynamics, 6EC
AP3352, Introduction to Nuclear Science and Engineering, 6EC
AP3382, Advanced Photonics, 6EC
AP3391, Geometrical Optics, 6EC
AP3401, Introduction to Charged Particle Optics, 6EC
AP3531, Acoustical Imaging, 6EC
AP3652, Electronics for Physicists, 3EC
AP3701, Submm and Terahertz Physics and Applications, 3EC
AE4880, Space Instrumentation, 4EC
EE4745, Terahertz Superconducting Astronomical Instrumentation, 5EC
ME46310, Opto-Mechatronics, 4EC
SC42030, Control for High Resolution Imaging, 3EC
SC42065, Adaptive Optics Design Project, 3EC

e. Physics for Quantum Devices and Quantum Computing:

AP3082, Computational Physics, 6EC
AP3101, The Interpretation of Quantum Mechanics, 3EC
AP3113, Quantum Optics, 6EC
AP3202, Topology in condensed matter, 6EC (not scheduled in 2022-2023)
AP3211, Advanced Solid State Physics, 6EC
AP3222, Nanotechnology, 6EC
AP3252, Electron Microscopy Characterization of the Nanoscale, 3EC
AP3261, Mesoscopic Physics, 6EC
AP3271, Molecular Electronics, 6EC
AP3281, Quantum Transport, 6EC
AP3303, Applications of Quantum Mechanics, 3EC
AP3421, Fundamentals of Quantum Information, 4EC
AP3421-PR, Quantum Information Project, 2EC
AP3432, Quantum Hardware 1 - Theoretical Concepts, 4EC
AP3442, Quantum Hardware 2 - Experimental State of the Art, 4EC
AP3472, Modelling of Superconducting Devices, 4EC
AP3652, Electronics for Physicists, 3EC
AP3663, Special Topics in Quantum Technology, 4EC
AP3681, Fairy Tales of Theoretical Physics, 6EC
CESE4080, Quantum Computing Architecture and Electronics, 5EC
CS4090, Quantum Communication and Cryptography, 5EC (or CS4090AM, 6EC)

5.1.5 G-,T-, or GE-list elective: 6 EC

The remaining module(s) can be chosen from subjects from the G-list or the T-list, or a more general elective from the GE-list can be taken:

4403TGR64, Theory of General Relativity, 6EC
CS4195, Modelling and Data Analysis in Complex Networks, 5EC
CS4220, Machine Learning 1, 5EC
AP3831, Systems Engineering for Physicists, 3EC (or EE4C11, 5EC)
IN4049TU, Introduction to High Performance Computing, 6EC
LM3691, iGEM, 18EC - a maximum of 12 EC of this module can be included in the MSc programme; 6EC must be done extra-curricular.
WI4201, Scientific Computing, 6EC
WI4260TU, Scientific Programming for Engineers, 3EC
IFEEMCS4250, Statistical Learning for Engineers, 4EC
WI4430, Martingales, Brownian Motion, and Stochastic Processes, 6EC
WI4771TU, Object Oriented Scientific Programming with C++, 3EC

If a student wishes to take a module, within or outside of the faculty, that's not on the lists approval from the Board of Examiners must be obtained.

5.2 Orientations

Combining the core programme with a 30 EC orientation completes the master programme.

5.2.1 Research and Development (R&D)

The R&D orientation is the only orientation that allows for incorporating bridging/homologation courses in the programme (see article 6). It consists of two of the following three blocks of modules:

a. a non-academic internship, often done abroad (18 EC).

AP3911, Internship in Industry, 18EC

b. a group design project and a preparatory design course (18 EC).

AP3831, Systems Engineering for Physicists, 3EC (or EE4C11, 5EC)
AP3841, Physics Design Project, 15EC

The Physics Design Project can be replaced by a Joint Interdisciplinary Project (TUD4040) provided that the project has a sufficiently large physics component (to be approved by the Board of Examiners).

c. additional electives (12 EC).

6 EC G-, T-, or GE-list modules.
6 EC G-, T-, GE-, or S-list modules; or assigned homologation modules.

G-, T-, and GE-list modules are listed in art. 5.1.
For homologation modules see art. 6.
S-list (Societal) example modules are:

AS3111, ATHENS, 2EC
AS3121, Scientific Writing and Argumentation, 3EC
AS3131, Art, Empathy & Ethics, 4EC
AS3141, Multidisciplinary Project, 6EC
TPM001A, Sociotechnology of Future Energy Systems, 4EC
TPM007A, Talk Like TED, 3EC
TPM301B, Spoken English for Academic Purposes – intermediate, 2EC
TPM302B, Spoken English for Academic Purposes - advanced, 2EC
TPM303A, Writing in English for the University, 2EC
TPM304A, Advanced Writing in English for the University, 2EC
TPM305A, Writing a Master's Thesis in English, 2EC
TPM401A, Technology Entrepreneurship and Innovation, 5EC
TPM402A, Technology Entrepreneurship and Health, 5EC
TPM403A, Technology Entrepreneurship and Sustainability, 4EC

TPM404B, Technology Entrepreneurship and Global Development, 5EC
TPM405A, Patent Law and Patent Policy, 5EC
TPM406A, Corporate Entrepreneurship and Startups, 5EC
TPM411A, Idea to Startup – IT & AI, 5EC
TPM412A, Idea to Startup – Health & Life Sciences, 5EC
TPM413A, Idea to Startup – Energy & Sustainability, 5EC
TPM414A, Idea to Startup – Deep Tech, 5EC
TPM416A, Turning Technology into Business, 6EC
TPM420A, Ready to startup, 6EC
TPM424B, The Climate Leadership Journey, 6EC
TPM425A, Experience Entrepreneurship, 3EC
WM0203TU-Eng, Oral Presentations, 2EC
WM1115TU, Dutch Elementary 1, 3EC
WM1116TU, Dutch Elementary 2, 3EC
WM1117TU, Dutch Intermediate 1, 3EC
WM1135TU, Advanced English for the University, 3EC

For the complete list see: http://studiegids.tudelft.nl/a101_displayProgram.do?program_tree_id=28704.
Only subjects marked as 'Category MSc level' are accepted.

Students can fulfil the requirements for the Technology in Sustainable Development, Entrepreneurship, Nuclear Science and Engineering, and Quantum Technologies annotations. Certificates will be granted during the graduation ceremony upon request of the student.
The final date to receive a TU Delft Annotation certificate is September 30, 2022. No annotation certificates will be issued after this date.

5.2.2 Education (Ed1/Ed2)

The educational programmes are aimed at Dutch-speaking students only, because they are oriented towards the Dutch school system and because it includes internships (Schoolpracticum) at Dutch schools. Consequently the educational orientation modules are taught in Dutch. The programme consists of Basisdeel/Ed1 (30 EC) and Verdiepingsdeel/Ed2 (30 EC).
The minor Education (Basisdeel/Ed1) can be done as part of the bachelor programme and leads to qualification as a tweedegraads secondary school teacher with limited qualification (beperkte bevoegdheid). If a student took the minor Education, only the Verdiepingsdeel/Ed2 of 30 EC remains for the master programme orientation. The combination of the minor Education and the Ed2 orientation leads to qualification as a fully-qualified eerstegraads (grade-one) secondary school teacher.
Students that did not take the minor Education can follow the Basisdeel/Ed1 orientation as part of their master programme and then optionally do the Verdiepingsdeel/Ed2 as a post-master course in order to become fully qualified.
Timely registration with the coordinator of the MSc Science Education and Communication is necessary for participation in the orientation and to be assured of an internship at a school. Application deadlines are stated in the study guide.

30 EC Education - Basisdeel (Ed1)
SL3462, Educational Sciences, 6EC
SL4201, Pedagogy of STEM education, 4EC
SL4202, Professional Learning Community, 1EC
SL4220, Physics Teaching Methodology, 4EC
SL4225, Physics Foundation Teaching Placement, 15EC
30 EC Education - Verdiepingsdeel (Ed2)
SL3012, Personal Professional Development, 3EC
SL4300, Design and Research in Education, 10EC
SL4320, Advanced Physics Teaching Methodology, 5EC
SL4325, Advanced Physics Teaching Placement, 12EC

5.2.3 Management of Technology (MoT)

This orientation is offered by the faculty of Technology, Policy and Management. The programme consists of either the first semester or the second semester of the MSc Management of Technology. A mixture of courses from both semesters is only permitted if it's a coherent set of modules that is approved in advance.
Because of the limited capacity at the TPM faculty to take these courses, it is necessary to timely register with the Applied Physics programme coordinator for taking this orientation. Details are stated in the study guide.

1st SEMESTER MoT Modules (30 EC)
MOT1412, Technology Dynamics, 5EC
MOT1421, Economic Foundations, 5EC
MOT1442, Social and Scientific Values, 5EC
MOT1461, Corporate Finance, 5EC
MOT1524, Leading and Managing People, 5EC
MOT1532, High-tech Marketing, 5EC
2nd SEMESTER MoT Modules (30 EC)
MOT1003, Integration Moment, 5EC
MOT1435, Technology Strategy and Entrepreneurship, 5EC
MOT1452, Inter- and Intra-organisational Decision Making, 5EC
MOT1531, Business Process Management & Technology, 5EC
MOT2313, Research Methods, 5EC
MOT2421, Emerging and breakthrough Technologies, 5EC

5.2.4 Study abroad

This orientation consists of a semester at a foreign university. A package of 30 EC of courses - optionally including a research project of a maximum of 20 EC - must be done. A maximum of 7.5 EC of language/societal courses can be done within the orientation. A Study Abroad programme must always be approved by the board of examiners in advance.
Because the number of available places (per destination) is limited, selection takes place at the international office. It is necessary to register with them in time. Deadlines are stated in the study guide.
Grades obtained abroad are not converted into Dutch grades. Results obtained abroad are not included in the calculation of the GPA (a.o. for graduating with honours).

5.3 Special programmes

5.3.1 Casimir pre-PhD special programme

This programme, linked to the BN and QN departments, focuses on preparing and educating students for a PhD position within the Leiden Institute of Physics, the Kavli Institute of Nanoscience in Delft, or elsewhere. It's also designed to respond to the increased mobility of students after their BSc and entering a MSc programme.
Leiden University and Delft University of Technology have established in 2004 the Casimir graduate school (http://casimir.researchschool.nl) which accommodates PhD students within the Kavli Institute of Nanoscience in Delft and the Leiden Institute of Physics. The research within the school is grouped into six themes, each covering theoretical, experimental and applied research areas both at Leiden and Delft.
For Applied Physics students in Delft, admission into this programme proceeds as follows. Students within the Applied Physics degree courses inform the coordinator that they are interested in following the Casimir special programme in the course of their first semester. After the examination period in January, a special committee consisting of staff members from both Leiden and Delft decides on the admission into the programme. Students who are declined can continue with the regular AP programme without incurring delays.
Students should in principle complete this programme within two years. In cases where students incur substantial delays without good reason, the admission into the special programme can be withdrawn.
Participation in the Les Houches summer school (France) which is organized jointly with French Universities in Grenoble and Lyon. This course is not compulsory although it is strongly encouraged to participate. Participation is free for students admitted into the Casimir special programme.

The Casimir special programme comprises:

- **Obligatory Modules, 12 EC:**

AP3001, Mathematical Methods for Physics, 9EC
WM0320TU, Ethics and Engineering, 3EC

- **General Advanced Physics Modules (G-list), 12 EC:**

AP3021, Advanced Statistical Mechanics, 6EC
AP3051, Advanced Quantum Mechanics, 6EC

- **Casimir Elective Modules, 30-36 EC:**

AP3032, Continuum Physics, 6EC
AP3071, Advanced Electrodynamics, 6EC
AP3082, Computational Physics, 6EC
AP3101, The Interpretation of Quantum Mechanics, 3EC
AP3113, Quantum Optics, 6EC
AP3162, Physics of Biological Systems: Mathematical modelling in Systems Biology, 6EC
AP3202, Topology in Condensed Matter, 6EC
AP3211, Advanced Solid State Physics, 6EC
AP3222, Nanotechnology, 6EC
AP3252, Electron Microscopy Characterization of the Nanoscale, 3EC
AP3261, Mesoscopic Physics, 6EC
AP3271, Molecular Electronics, 6EC
AP3281, Quantum Transport, 6EC
AP3303, Applications of Quantum Mechanics, 3EC
AP3421, Fundamentals of Quantum Information, 4EC
AP3421-PR, Quantum Information Project, 2EC
AP3432, Quantum Hardware 1 - Theoretical Concepts, 4EC
AP3442, Quantum Hardware 2 - Experimental State of the Art, 4EC
AP3472, Modeling of Superconducting Devices, 4EC
AP3511, Biophysics / NB4070, Soft Matter Physics, 6EC
AP3652, Electronics for Physicists, 3EC
AP3663, Special Topics in Quantum Technology, 4EC
AP3681, Fairy Tales of Theoretical Physics, 6EC
CESE4080, Quantum Computing Architecture and Electronics, 5EC
CS4090, Quantum Communication and Cryptography, 5EC (or CS4090AM, 6EC)
NB4150, The Origin and Synthesis of Life, 6EC
NB4160, Engineering of Living Systems, 3EC
4403ADVOP, Advanced Optics, 6EC
4403EFTH3, Effective Field Theory, 3EC
4403QFTH6, Quantum Field Theory, 6EC
4403SIMOP, Single Molecule Optics, 6EC
4403TCM06, Theory of Condensed Matter, 6EC

- **Other Physics Electives 0-6 EC**

- **A research project of 36 EC** (AP3902CAS) in a department in of the Kavli Institute in Delft or the LION in Leiden.
- **Two smaller projects of 8 EC** each (AP3961, AP3971/AP3972), to be carried out in different groups, and in a different group than where the 36 EC Research project takes place.
- **Writing a PhD research proposal** (AP3952, 8EC), possibly based on the large or on the smaller research projects.

5.3.2 Delft Jena Photonics special programme

In this programme, fitting within the Physics for Instrumentation track with a focus on photonics, students do the second year of the programme (including the thesis project) at the Abbe Center of Photonics of the Friedrich-Schiller-Universität in Jena. This collaboration is supported by the German Fraunhofer Institute for Applied Optics and Precision Mechanics (IOF), TNO, and two industrial partners, namely ASML and Carl Zeiss AG.
In this program, the orientation study abroad is combined with a thesis project that is being carried out in Jena. The first year is done in Delft; the second year in Jena. The thesis project is done under the responsibility of a TU Delft supervisor and co-supervised by a supervisor from the Friedrich-Schiller-Universität. The thesis defence takes place in Delft.
The programme comprises:

- **Obligatory Modules, 12 EC:**

AP3001, Mathematical Methods for Physics, 9EC
WM0320TU, Ethics and Engineering, 3EC

- **General Advanced Physics Modules (G-list), 12 EC:**

AP3071, Advanced Electrodynamics, 6EC
second G-list course, 6EC

- **Physics for Instrumentation T-list Modules, 12 EC.**

Strongly recommended are:

AP3122, Advanced Optical Imaging, 6EC
AP3243, Lasers and Photodetectors, 3EC
AP3382, Advanced Photonics, 6EC
AP3391, Geometrical Optics, 6EC

- **Other Physics Electives done in Delft 18-24 EC**
- **MSc Photonics Electives done in Jena 12-18 EC**
- **Master Thesis Project, 48 EC**

AP3902, Master Thesis, 48EC - done in Jena.

5.3.3 Honours Programme (TER art. 10)

The Honours Programme consists of at least 20 EC on top of the regular master programme of 120 EC. The full Applied Physics programme including the additional honours track should be finished according to schedule. It is an individual programme that contains a 5 EC specially developed course for all TU Delft honours track students plus a coherent package of at least 15 ec of challenging course modules or projects composed by the student.

Programme			Credits
Obligatory Collective Part – choice of UD2010, Critical Reflection on Technology UD2012, Business Leadership for Engineers TPM019A, Leadership Skills for Engineers			5
Individual Part **Examples:** Company Oriented HPM AS1011HPM AS1021HPM Research Oriented HPM AS1031HPM x Coherent package of courses example: AP3932HPM	 Applied Sciences Company Project Applied Sciences Honours Classes Applied Sciences Research Project Project related course Summer School Casimir pre-PhD programme	 12 3 9-15 0-6 5	15

5.3.4 Double degree programme[1] Applied Physics – Management of Technology

This is a three year programme Applied Physics – Management of Technology of the Faculties of Applied Sciences (AS) and Technology, Policy and Management (TPM).

Students finishing a Master AP degree with orientation MoT may decide to do an additional year of Master MoT courses and thesis in order to obtain a double degree in both AP and MoT. Admission to this double degree programme is decided upon by the programme directors of the MSc Applied Physics and the MSc Management of Technology. The programme consists of:

Programme	EC
The AP core programme	90
The AP orientation MoT / 1st semester MoT modules (list of modules in art. 4.2.3)	30
2nd semester MoT modules (list of modules in art. 4.2.3)	30
MOT2004, Preparation for the Master Thesis	5
MoT MSc Thesis Project (MOT2910)	30

The 120EC Applied Physics part of the programme consists of the 90EC AP Core Programme and the 30EC second semester MoT modules.

[1] More generally, double degree programmes combining applied physics with other master courses taught at TU Delft are possible, but always subject to the restrictions imposed by the university. The main restrictions are that the double degree programme comprises at least 180 EC and that there are two identifiable final project reports for both degrees. Formal admission by the programme directors is required in advance.

5.3.5 Double degree programme Applied Physics – Applied Mathematics

This is a three year programme Applied Physics – Applied Mathematics.
Admission to this double degree programme is decided upon by the programme directors of the MSc Applied Physics and the MSc Applied Mathematics. A double bachelor programme or a bridging programme is required to enter this programme.

The programme consists of:

Option 1 - two different thesis projects:

Programme	**EC**
AP courses: AP3001-FE (Finite Elements)* – 3 EC WM0320TU (Ethics and Engineering) – 3 EC G-list courses – 12 EC T-list courses – 12 EC G-,T-, or GE-list, or math courses instead of AP3001 parts already covered* – 6 EC G-,T-, or GE-list course – 6 EC	42
AP Thesis Project	48
AM courses: - Common courses (6 EC); WM1028AM (Ethics for Applied Mathematics) is not needed if WM0320TU is done - Orientation course (6 EC); - Specialisation courses 36 EC, should be mathematics courses.	48
AM Thesis Project	42

*If applicable Applied Physics bridging/homologation courses can also be done in the programme here.
AP3001 parts are covered by (list is not complete):
Complex Analysis : AM2040, TW2040, WI2602, EE2M11;
Finite Elements : WI4014TU, WI4205;
Partial Differential Equations : AM2070, TW2070, WI2607 or WI3150TU+WI3151TU/WI4150TU.

The 120EC Applied Physics programme consists of the 90EC AP courses and thesis project and 30EC of AM orientation and specialisation courses.

Option 2 - combined thesis project and industrial internship:

Programme	**EC**
AP courses - as above	42
AM courses - as above	48
Double Degree Combined Thesis Project	60
Design Project (AP3831+AP3841) or Industrial Internship (AP3911 or WI5118)	18
Additional AP G-,T-, or GE-list course	6
Additional AM elective course	6

The 120EC Applied Physics programme consists of 42+6 EC of AP courses, 18 EC Design Project or Industrial Internship, 48 EC for the Thesis Project and the 6 EC AM orientation course.

5.3.6 Free study programme (WHW art. 7.3d)

Students may compile a free curriculum concluded by a final exam. Such a curriculum must consist entirely or mainly of modules given in conjunction with the programme. It has to comply with the final attainment levels of the programme. The curriculum must be accompanied by a justified request and submitted to the Board of Examiners for approval.

Article 6 Bridging and homologation programmes

Article 1 states that students can be admitted to the programme with a compulsory homologation programme. If homologation modules are assigned, a maximum of 6 EC can be incorporated in the Master programme in the R&D orientation (see article 5.2.1.c).

Students holding a Bachelor of Science degree in Aerospace Engineering, Applied Earth Sciences, Applied Mathematics, Electrical Engineering, Mechanical Engineering, Molecular Science and Engineering, or Nanobiology from Delft University of Technology may apply, but, if admitted, will be required to follow a bridging and/or homologation programme to provide them with the required background to allow them to complete the Master programme.
Bridging modules must be completed before a student can be admitted in the Master programme; homologation modules can be done as part of the Master. The bridging and/or homologation programmes are listed below. The final decision about a bridging or homologation programme, also in other cases, is made on an individual basis.

Students can be admitted to the Master programme if the extent of their deficiencies is limited to a maximum of 18 EC. If deficiencies extend this size, students can only be admitted to the bridging programme. Completion of the bridging programme by students formally admitted to it guarantees admission to the Master programme.
A maximum of 18 EC of homologation modules can be incorporated in the Master programme, if an exemption is obtained for the Industrial Internship (AP3911); otherwise 6 EC of homologation modules can be done in the R&D orientation and if exemptions have been obtained for compulsory courses (Mathematical Methods for Physics and/or Ethics and Engineering) homologation courses can be done as alternatives.

Required bridging/homologation courses for TU Delft BSc Aerospace Engineering:

TN2054, Electromagnetisme, 6EC
TN2304, Kwantummechanica 1, 3EC (or TN2305, 4EC)
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2421, Optica, 3EC
TN2612, Relativiteitstheorie, 3EC
TN2626, Statistische Fysica, 6EC (or TN2625, 4EC)
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC

Required bridging/homologation courses for TU Delft BSc Applied Earth Sciences:

TN2054, Electromagnetisme, 6EC
TN2211, Electronische Instrumentatie, 6EC
TN2304, Kwantummechanica 1, 3EC (or TN2305, 4EC)
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2421, Optica, 3EC
TN2612, Relativiteitstheorie, 3EC
TN2626, Statistische Fysica, 6EC (or TN2625, 4EC)
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC

Required bridging/homologation courses for TU Delft BSc Applied Mathematics:

TN2054, Electromagnetisme, 6EC
TN2211, Electronische Instrumentatie, 6EC
TN2304, Kwantummechanica 1, 3EC (or TN2305, 4EC)
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2421, Optica, 3EC
TN2612, Relativiteitstheorie, 3EC (not required if TN1531TW is done)
TN2626, Statistische Fysica, 6EC (or TN2625, 4EC)
TN2786, Fysische Transportverschijnselen, 6EC (or 4052FYSTRY, 6EC)
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC

Required bridging/homologation courses for TU Delft BSc Electrical Engineering:

TN2304, Kwantummechanica 1, 3EC (or TN2305, 4EC)
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2421, Optica, 3EC
TN2612, Relativiteitstheorie, 3EC
TN2626, Statistische Fysica, 6EC (or TN2625, 4EC)
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC
TN2786, Fysische Transportverschijnselen, 6EC (or 4052FYSTRY, 6EC)

Required bridging/homologation courses for TU Delft BSc Mechanical Engineering:

TN2054, Electromagnetisme, 6EC
TN2304, Kwantummechanica 1, 3EC (or TN2305, 4EC)
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2345, Inleiding Golven, 3EC
TN2421, Optica, 3EC
TN2612, Relativiteitstheorie, 3EC
TN2626, Statistische Fysica, 6EC (or TN2625, 4EC)
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC

Required bridging/homologation courses for TU Delft BSc Molecular Science and Technology:

TN2054, Electromagnetisme, 6EC
TN2211, Electronische Instrumentatie, 6EC
TN2304, Kwantummechanica 1, 3EC (or TN2305, 4EC)
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2345, Inleiding Golven, 3EC
TN2421, Optica, 3EC
TN2545, Systemen en Signalen, 6EC
TN2612, Relativiteitstheorie, 3EC
TN2626, Statistische Fysica, 6EC (or TN2625, 4EC)
TN2786, Fysische Transportverschijnselen, 6EC (not if 4052FYSTRY) is done
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC

Required bridging/homologation courses for TU Delft BSc Nanobiology:

TN2054, Electromagnetisme, 6EC
TN2304, Kwantummechanica 1, 3EC (or NB3017, 2.5EC)
TN2314, Kwantummechanica 2, 3EC (or NB3018, 2.5EC)
TN2321, Klassieke Mechanica, 3EC
TN2345, Inleiding Golven, 3EC
TN2421, Optica, 3EC
TN2612, Relativiteitstheorie, 3EC
TN2626-D2, Statistische Fysica, 3EC
TN2786, Fysische Transportverschijnselen, 6EC (or 4052FYSTRY, 6EC)
TN2844, Vaste Stof Fysica, 6EC
TN2953SO, Research Practicum, 3EC

For students holding a Bachelor of Engineering (HBO) degree in applied physics, the bridging/homologation programme is:

TN1142WI, Lineaire algebra deel 1, 3EC (or IFEEMCS010400, 5EC)
TN2054, Electromagnetisme 1, 6EC
TN2244WI, Lineaire Algebra en Differentiaalvergelijkingen, 6EC
TN2304, Kwantummechanica 1, 3EC
TN2314, Kwantummechanica 2, 3EC
TN2321, Klassieke Mechanica, 3EC
TN2345, Inleiding Golven, 3EC
TN2421, Optica, 3EC
TN2545, Systemen en Signalen, 6EC
TN2626-D1, Statistische Fysica, 3EC
TN2953SO, Research Practicum, 3EC

The quantum mechanics subjects TN2304 and TN2314 form a module. The minimum pass grade for these subjects is 5.0, provided that the weighted average of the two subjects is at least 5.8.

Article 7 Examinations

7.1 The form of the examinations and the methods of assessment

The form of the examinations and the methods of assessment are described in the study guide, http://ap.msc.studyguide.tudelft.nl.

7.2 Order of the examinations

1. In general, there are no requirements with regard to the order in which courses and examinations are taken.
2. If there are conditions for participating in a particular course or an examination with regard to previously completed courses, this is stated in the study guide.
3. Notwithstanding the provisions of sections 1 and 2, there are conditions for starting the Master Thesis Project work (AP3902-MTP). You may start your Master Thesis Project work if you:

- have been admitted to the master programme Applied Physics,
- have passed bridging/homologation courses or other obligations from the bachelor programme,
- have passed all obligatory (12EC), G-list (12 EC) and T-list (12EC) courses,
- have made a project plan with your thesis supervisor (Preparation for the Master Thesis, AP3902-PMT), and
- have handed in the signed thesis registration form together with the project plan at the thesis office.

There are no requirements with regard to completed courses for starting the Preparation for the Master Thesis.

7.3 Graduation Project, Master's thesis

The following regulations have been drawn up to make the time spend on the thesis project in line with the credits obtained for it and to avoid unnecessary delays.

1. The master thesis project consists of two separate stages: a 6 EC preparation, followed by 42 EC thesis work that includes writing the report and giving the final presentation.

2. The Preparation for the Master Thesis consists of
   - Reading background literature necessary for the project;
   - Acquiring necessary skills, such as learning to work with experimental set-ups, clean room and/or computer skills, and transferable/soft skills;
   - Identifying areas, in collaboration with the supervisor, where extra training is necessary, for example English writing skills, presenting, a particular course, etc.;
   - Formulating the research goal of the project: which question will be addressed and what method(s) will be applied to arrive at the answer;
   - Making a planning, including anticipating pitfalls and how these will be dealt with in order to prevent delays (e.g. equipment failure, delayed delivery of materials, sharing/availability of facilities);
   - Writing a project plan.

3. The expected time spent on the Preparation for the Master Thesis corresponds to 6 EC (1 month FTE); usually it is spread over a longer period of time, parallel to other courses. During the preparation stage meetings with the responsible supervisor are required for discussing the different issues.

4. The result of the Preparation for the Master Thesis is a project plan which addresses the project goal, the name of your supervisor(s) and others involved in the project, the track of the Master's programme, knowledge (e.g. courses done) and skills that you will use in the project, required training for skills that need improvement, anticipated pitfalls and how these will be dealt with, agreements about supervision (such as the meeting frequency between the student and the responsible supervisor), and a time planning. The report typically contains between 4 and 7 pages.

5. The time planning is based on 7 months FTE, the equivalent of 42 EC. The time taken to complete courses the student still has to do, exams, regular holidays, and work have to be taken into account to arrive at the intended end date on which the final version of the thesis should be handed in.
   The time planning also takes into account known periods of absence of the supervisor and contains agreements on ways of communication and/or substitution during these periods. Absence of the supervisor cannot be used to justify delay. Neither does an impending publication, or more/better results.
   The time schedule is binding and contains a green light meeting two weeks prior to the end date for handing in the final version of the thesis.
   The schedule also contains the dates for two intermediate evaluations that are meant to give feedback to the student on her/his performance. Proposed timeslots are after a period equal to three months FTE (ca 40%) and five months FTE (ca 70%). The learning outcomes - as stated in the master's thesis grading scheme - should be used for these intermediate evaluations of the student.

6. After approval of the project plan by the responsible supervisor – and before the start of the second stage of the thesis project – the signed thesis project registration form must be handed in, together with the project plan, at the thesis office via the programme coordinator.

7. The assessment of the student is based on the learning goals of the master's thesis project rather than on whether the planned research outcome has been realized.
   On behalf of the Board of Examiners, the responsible supervisor composes a suitable assessment committee. The committee consists of at least three examiners, all members of the scientific staff of research groups that contribute to the master's degree programme. The members of the assessment committee come from at least two different sections of the degree programme, at least one of the members belongs to the teaching staff of the degree programme (of a course other than the thesis project), and at least one of them is a full professor or an associate professor with 'ius promovendi'.
   Thesis projects carried out in affiliated groups outside the Faculty of Applied Sciences shall be assessed by a committee including at least one examiner from the Faculty of Applied Sciences.

8. The thesis office reminds the responsible supervisor and student in time to have the green light meeting. If the responsible supervisor is confident that the student will pass the defence, the exact time and date of the final presentation and thesis defence are fixed and the members of the assessment committee confirmed at this meeting. Both the date/time and the committee are determined by the thesis supervisor after hearing the student. In principle the defence takes place within two weeks after the end date for handing in the final version of the thesis. The supervisor reports the date of the defence and the composition of the assessment committee to the thesis office. In exceptional cases, the board of examiners may be involved in setting the date and time.
   If the responsible supervisor is in doubt whether the student will pass the defence, he/she should discuss with the other members of the assessment committee whether to give green light or not.

9. In the case that, in spite of the effort, the student is seriously failing, the responsible supervisor can decide at the green light meeting to cancel the planned defence if he/she is confident that the student won't pass the defence. The supervisor needs to deliver a written argumentation for this decision to the thesis office and the programme coordinator. Prior to this decision the student must be warned repeatedly, at least at the intermediate evaluation, to give him/her a chance to improve.
   After a negative decision, a choice must be made in consultation with the student between a delay (with a new binding time schedule with a maximum of three months) or a definitive cancellation of the thesis project. The thesis project can be delayed only once. Cancellation implies starting a new project.
   Note that an impending publication or more/better results are not valid reasons for an extension.

10. In case of unforeseen personal circumstances (illness; pregnancy and childbirth; exceptional family circumstances; physical, sensory or other functional disabilities) the student can apply for an extension of the end date (on which the final version of the thesis report needs to be handed in) to the Board of Examiners, with a statement of the academic counsellor. Students are required to contact the academic counsellor as soon as possible after the particular circumstance has occurred. The information is treated confidentially by the academic counsellor.
    In case of exceptional events, an extension of the end date (on which the final version of the thesis report needs to be handed in) can be granted by the Board of Examiners. Reasons for this should be non-project related and non-private; e.g. unexpected absence of the responsible supervisor without a suitable alternative responsible supervisor available.

Further rules governing MSc graduation projects can be found in article 21 of the Rules and Regulations of the Board of Examiners.

Article 8 Transition ruling

The core programme described in article 5 is compulsory for students who enrolled after 30-06-2011 for the first time in the master Applied Physics.
Students who enrolled before 01-07-2011 can choose between the previous programme (instead of AP3001 a choice of at least 6 credits from WI3150TU, WI4014TU, WI4143TN, and WI4150TU, and 3 credits from the S-list) and the new programme.
Students who enrolled before 01-07-2011 can put the modules AP3011, AP3061, AP3081 and AP3091 on their G-list even if they apply for the new programme, provided they have passed those modules before 01-09-2012.

If WI4243AP/AP3001 is part of a student's programme WI3150TU, WI4014TU, WI4143TN, and WI4150TU can't be chosen as optional modules.

Students enrolled before 01-09-2016 starting the thesis work after 01-07-2017 will do AP3902 instead of AP3901. The regulations in article 7.3 are mandatory for all students who hand in the approved (by the responsible supervisor) report of the 'preparation for the master thesis' or start the thesis project work after 31-12-2020.

Before 2010-2011 AP3241TU (Particle Therapy Holland) was a D-list module; from 2010-2011 it's on the R-list.
Before 2011-2012 CH3771 (Nuclear Chemistry) was a D-list module; from 2011-2012 it's on the R-list.
AP3132D (Advanced Digital Image Processing) is a D-list module; before 2017-2018 ET4283 was on the R-list.
Either AP3421D (from 2017-2018) or AP3292D (before 2017-2018) counts as a D-list module; not both.

Equivalences:
AP3001 = WI4243AP-11
AP3001-CA = WI4243AP-CA = WI4244AP = WI4143TN = WI2602 = TW2040 = AM2040= EE2M11
AP3001-FE = WI4243AP-FE = WI4014TU = WI4205
AP3001-PDE = WI4243AP-PDE = WI3150TU + WI3151TU / WI4150TU = WI2607 = TW2070 = AM2070
AP3021 = AP3021G
AP3032 = AP3032G
AP3051 = AP3051G
AP3061 = AP3061D
AP3071 = AP3071G
AP3082 = AP3082D = AP3081D
AP3091 = AP3091D
AP3113 = AP3112 = AP3112D = AP3111D
AP3122 = AP3221 = AP3121D
AP3132 = AP3132D = ET4283
AP3141 = AP3141D
AP3162 = AP3162D = AP3161D
AP3171 = AP3171D
AP3181 = AP3181D
AP3211 = AP3211D
AP3222 = AP3232D = AP3221D = NS3501
AP3232 = AP3232D = AP3231D
AP3242 = AP3241
AP3261 = AP3261D = NS3521
AP3271 = NS3531 = 4403MOLE6
AP3281 = AP3281D = NS3571
AP3292 = AP3292D = AP3432 + AP3442
AP3311 = AP3311D
AP3341 = AP3341D
AP3352 = CH3792
AP3371 = AP3371TUD
AP3382 = AP3381
AP3392 = AP3391
AP3421 = AP3421D
AP3461 = NB4150
AP3511 = AP3511D = NB4070 = NS3511
AP3582 = AP3581 + AP3242
AP3652 = AP3651
AP3691 = AP3691D = NB4160
AP3831 = EE4C02 = EE4C11
AP3841 = AP3843
AP3902 = AP3901
AP3971 = AP3972
CESE4080 = EE4575
ME45030 = ME45031 = WB1424ATU
ME45040 = ME45041 = ME45042 = ME45043 = WB1427-13

Equivalences for Bridging programmes:

TN1142WI = WI1142TN
TN1612SK, 2 EC = TN2612, 3 EC
TN2053 = TN2054
WI2140TN, 4 EC = WI2240TN, 3EC + TN2953DV, 1 EC
TN2244WI, 6 EC = WI2240TN, 3EC + WI2242TN, 3 EC
TN2301 = TN2302 = TN2303 = TN2304 = TN2305
TN2311 = TN2312 = TN2314
TN2624 = TN2626
TN2624NB = TN2626-D1
TN2785 = TN2786
TN2843, 5 EC = TN2844, 6 EC
TN4780TA, 4 EC = TN2785, 6 EC = SET3021, 4 EC = 4052FYSTRY, 6EC

TN2953SK, 2 EC + TN2953DV, 1 EC = TN2953SO, 3 EC (voor HBO schakelaars)
TN2953SK, 2 EC = TN2953SO, 3 EC (voor overige schakelaars)