# IMPLEMENTATION REGULATIONS
# additional to the Teaching and Examination Regulations for the Master programme "Applied Physics"

## Delft University of Technology
## 2011-2012

## Section 1 CORE PROGRAMME AND SPECIALISATIONS

The programme Applied Physics is a two-year master programme and comprises 120 EC.
The programme has a core-specialisation structure. Within this structure, there is a choice of research tracks. The core programme comprises 90 EC and has the same structure for all Master students.
Combining the core programme with a 30 EC specialisation completes the master programme.
Courses that form part of the students bachelor programme cannot be part of the master programme

**Tracks**
The tracks within the core programme correspond to the faculty's five physics departments:

- Bionanoscience (BN)
- Imaging Systems and Technology (IST)
- Multiscale Physics (MSP)
- Quantum Nanoscience (QN)
- Radiation, Radionuclides and Reactors ($R^3$)

**Specialisations**
Eight specializations of 30 EC each can be chosen. These specialisations sometimes imply restrictions on the core programme. The restrictions will be described in detail below.

1. Research and Development (R&D)
2. Astronomy and Instrumentation (AI)
3. Sustainability in Technology (SiT)
4. Education (Ed1/Ed2)
5. Management of Technology (MoT)
6. Annotation in Entrepreneurship (AE)
7. Nuclear Science and Engineering (NSE)
8. Casimir specialisation (Cas)

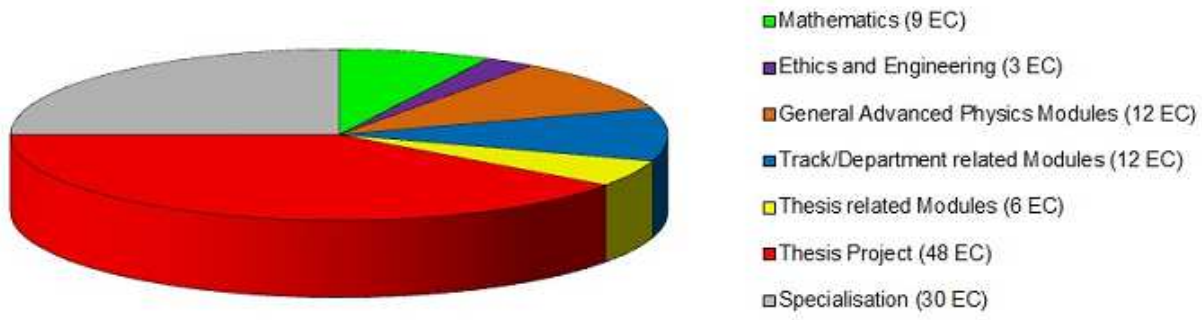
**Special programmes**
Special programmes within Applied Physics are:

- The Erasmus Mundus programme Optics in Science and Technology (OpSciTech): This programme consists of one year spent at Delft University of Technology and one year spent at one of the partner universities.
- Casimir pre-PhD: This programme, which is linked to the Casimir specialisation, focuses on educating students for a PhD position and is designed to respond to the increased mobility of students after their BSc.

**Programme additions**

- Honours track: This is an individual programme for talented students.
- Double degree programme: This is a three year programme Applied Physics – Management of Technology of the Faculties of Applied Sciences and Technology, Policy and Management.

**The programme**[1]




1 The programme for students who have started their Master in Applied Physics in 2011-2012

**Article 1 Core Programme**

**1.1 Obligatory Modules, 12 EC:**

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| WI4243AP, Mathematical Methods for Physics, 9EC |
| WM0320TU, Ethics and Engineering, 3EC |

**1.2 General Advanced Physics Modules (G-list): 12 EC** must be chosen from the 'G' list, the advanced 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.

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

**1.3 Track/Department related Modules (D-list): 12 EC** must be chosen from the 'D' list of technical and science subjects relating to departments BN, IST, MSP, QN and R³.
D-list courses are more specialised than G-list courses. They are in most cases representative for the research areas of one of the physics departments, although some D-list courses combine research areas of more than one department. The latter are denoted "Interdepartmental". The student must choose at least one module that belongs to the department of his or her choice.

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| AP3011, Chaotic Processes, 6EC, interdepartmental |
| AP3081, International Masters Course on Computational Physics, 6EC, interdepartmental |
| AP3091, Elementary Particles, 6EC, interdepartmental |
| AP3141, Environmental Physics, 6EC, interdepartmental |
| AP3671, Optical Wave Guiding, Photonic Crystals and Optical Functions, 6EC, interdepartmental |
| UL-TGR, General Theory of Relativity, 6EC, interdepartmental |
| AP3161, Cellular Dynamics: Stochasticity and Signalling, 6EC, BN |
| AP3511, Molecular Biophysics, 6EC, BN |
| AP3691, Evolution and Engineering of Living Systems, 6EC, BN |
| AP3061, Advanced Wave Propagation, 6EC, IST |
| AP3111, Quantum Electronics and Lasers, 6EC, IST |
| AP3121, Imaging Systems, 6EC, IST |
| AP3231, Medical Imaging, 6EC, IST |
| AP3171, Advanced Physical Transport Phenomena, 6EC, MSP |
| AP3181, Applied Multiphase Flow, 6EC, MSP |
| WB1422A, Advanced Fluid Dynamics A, 6EC, MSP |
| WB1424A, Turbulence A, 6EC, MSP |
| AP3191, Physics of Semiconductor Nanodevices, 6EC, QN |
| AP3211, Advanced Solid State Physics, 6EC, QN |
| AP3221, Nanotechnology, 6EC, QN |
| AP3261, Mesoscopic Physics, 6EC, QN |
| AP3281, Quantum Transport, 6EC, QN |
| AP3311, Neutrons, X-Rays and Positrons for Studying Microscopic Structures and Dynamics, 6ec, R3 |
| AP3341, Nuclear Reactor Physics, 6EC, R3 |
| AP3351, Radiation Detection and Medical Imaging, 6EC, R3 |
| AP3371, Radiological Health Physics, 6EC, R3 |
| CH3792, Nuclear Science, 6EC, R3 |

**1.4 Thesis related elective from G, D, R and M list: 6 EC** chosen freely from subjects within or outside of the faculty, under the condition that the thesis supervisor gives permission. Possible subjects include those from the 'G', 'D', 'R' or 'M' list. Subjects on the R list are highly specialised research topics. Subjects on the M list are mathematical topics which may be of interest for different research groups. If, following the advice of his or her supervisor, a student wishes to follow a subject that is not on the G, D, R or M lists, prior approval from the Board of Examiners should be obtained.

**Research list (R-list)**

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| AP3461, The Origins of Life, 6EC, BN |
| LM3512, Systems Biology, 3EC, BN |
| UL-AB, Advanced Biophysics, 6EC, BN |
| UL-BM, Biomolecular Motors, 6EC, BN |
| AP3381, Theoretical Optics, 6EC, IST-OP |
| AP3391, Geometrical Optics, 6EC, IST-OP |
| AP3401, Introduction to Charged Particle Optics, 6EC, IST-DO |
| AP3531, Acoustical Imaging, 6EC, IST-AK |
| AP3601, Optical Fabrication Technology, 6EC, IST-OP |
| AP3701, Submm and Terahertz Physics and Applications, 6EC, IST + QN-NF |
| ET4283, Advanced Digital Image Processing, 6EC, IST-QI |
| IN4085, Pattern Recognition, 6EC, IST-QI |
| SC4025, Control Theory, 6EC, IST (DCSC) |
| SC4110, System Identification, 5EC, IST (DCSC) |
| SC4120, Special Topics in Signal Processing & Control, 3EC, IST (DCSC) |
| AP3551, Computational Multiphase Flow, 6EC, MSP |
| AP3561, Turbulent Reacting Flows, 6EC, MSP |
| AP3571, Radiative Heat Transfer, 6EC, MSP |
| CH3052, Applied Transport Phenomena, 3EC, MSP |
| WB1428, Computational Fluid Dynamics, 3EC, MSP |
| WB1429, Microfluidics, 3EC, MSP |
| AP3271, Molecular Electronics, 6EC, QN |
| AP3291, Quantum Information Processing, 6EC, QN |
| AP3651, Electronics for Physicists, 6EC, QN |
| AP3661, Quantum Entanglement, 6EC, QN |
| AP3681, Fairy Tales of Theoretical Physics, 6EC, QN |
| AP3241, Particle Therapy Holland, 6EC, R3-RDM |
| AP3321, Special Topics in Nuclear Reactor Physics, 6EC, R3-PNR |
| AP3361, Medical Physics & Radiation Technology: Imaging, 6EC, R3-RDM/RIH |
| AP3581, Medical Physics & Radiation Technology: Radiotherapy, 6EC, R3-RDM/RIH |
| AP3631, Kinetics and Dynamics of Nuclear Reactors, 3EC, R3-PNR |
| AP3641, Nuclear Thermal Hydraulics, 3EC, R3-PNR |
| CH3581, Nuclear Materials, 3EC, R3-PNR/RIH |
| CH3762, Practical Radiochemistry, 3EC, R3-RIH |
| CH3771, Nuclear Chemistry, 6EC, R3-RIH |
| CH3782, Chemistry of the Nuclear Fuel Cycle, 3EC, R3-PNR/RIH |
| WB4416, Nuclear Engineering, 3EC, R3-PNR |

**Mathematical list (M-list)**

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| WI4005, Wavelets, 6EC |
| Wl4006, Special Functions, 6EC |
| Wl4037, Tensor Analysis, 4EC |
| WI4211, Advanced Topics in Analysis, 6EC |

**1.5 Master's Thesis Work:** to a total of **48 EC** (AP3901) in a research section of one of the physics departments BN, IST, MSP, QN, and R³, including affiliated groups: the Fluid Dynamics section (MSP track) or the Delft Centre for Systems and Control (IST track), both in the Department of Mechanical Engineering), or in the Chemical Engineering department (QN track).
The prior approval of the Board of Examiners should be obtained if the thesis work is performed outside one of the physics departments IST, MSP, QNS, BNS, R³, including affiliated groups. The Board of Examiners may then appoint a supervisor from one of the physics departments.
For the Casimir specialisation, the master thesis work has a different structure, see below.

## Article 2 Specialisations

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

### 2.1 Research and Development (R&D)

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| **18 EC** internship in a R&D institution (AP3911), preferably in industry or a research institution outside of TU Delft. |
| **6 EC**, freely chosen from the G, D, R, M or S lists.<br>The S (Society) list can be found at:<br>http://studiegids.tudelft.nl/a101_displayProgram.do?program_tree_id=9183 |
| **6 EC**, freely chosen from subjects within or outside of the faculty, under the condition that the thesis supervisor gives his or her permission. Possible modules include those from the G, D, R or M list.<br>If, following the advice of his or her supervisor, a student wishes to take a module that does not appear on these lists, prior approval should be obtained from the Board of Examiners. |

### 2.2 Astronomy and Instrumentation (AI)

Coordinator: Prof.dr.ir. T.M. Klapwijk.
This specialisation is a joint undertaking of the Observatory of Leiden University and the Faculty of Applied Sciences of TU Delft. The master thesis project should be related to astronomical research or some other form of space research. The programme should be approved by the AI coordinator.

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| **10-14 EC** Astrophysics Modules, chosen from:<br>AE4890, Planetary Sciences, 4EC<br>UL30, Galactic Structure, Dynamics and Evolution, 6EC<br>UL31, Interstellar Matter, 6EC<br>UL38, Stellar Dynamics, 6EC<br>UL39, Star and Planet Formation, 6EC<br>UL42, Stellar Structure and Stellar Evolution, 6EC<br>UL46, Origin and Evolution of the Universe, 6EC |
| **10-14 EC** Instrument-related Astronomy Modules, chosen from:<br>AP3091, Elementary Particles, 6EC<br>AP3121, Imaging Systems, 6EC<br>AP3391, Geometrical Optics, 6EC<br>AP3701, Submm and Terahertz Physics and Applications, 3EC<br>ET4147, Signal Processing for Communications, 4EC<br>ET4235, Digital Signal Processing, 4EC<br>ET4283, Advanced Digital Image Processing, 6EC<br>SC4120, Special Topics in Signal Processing & Control, 3EC<br>UL7, Detection of Light, 6EC<br>UL32, Data Handling & Mining, 3EC<br>UL36, Radio Astronomy, 6EC<br>UL40, Physics of Scientific Space Instruments, 4EC<br>UL41, Astronomy from Space, 6EC |

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| **6 EC**, freely chosen from subjects within or outside of the faculty, under the condition that the thesis supervisor gives his or her permission.<br>Possible modules include those from the G, D, R or M list.<br>If, following the advice of his or her supervisor, a student wishes to take a module that does not appear on these lists, prior approval should be obtained from the Board of Examiners. |

Required bachelor prerequisites: students who followed a minor in astronomy may enroll in this specialisation without any further preparation. Students who did not follow a major or minor programme in astronomy in their BSc education should study the courses TN1751 and UL44 before starting this programme.
Required bachelor prerequisites (for certain modules):

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| TN1751, Inleiding Sterrenkunde, 3EC<br>TN2545, Systemen en Signalen, 6EC<br>UL43, Galaxies and Cosmology, 5EC<br>UL44, Radiative Processes, 5EC<br>UL45, Astronomical Observing Techniques, 6EC |

### 2.3 Technology in Sustainable Development (TiSD)

Coordinator: Prof.dr.ir. C.R. Kleijn
This is a university initiative. Approval of the Master's thesis work and the internship by the coordinator is required. The thesis project must be focussed on sustainable development or the development of knowledge and technology aimed at a more sustainable future;

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| **15 EC internship** within a R&D institution (AP3922), preferably in industry or a research institution outside of TU Delft. The internship should have a clear relation to sustainability. |
| **5 EC** colloquium 'Technology in Sustainable Development' (WM0939TU). |
| **6 EC** Environmental Physics (AP3141). |
| **4 EC** of modules from the TiSD cluster-A and cluster-B list. At least 3EC must be chosen from the cluster B list.<br>The lists can be found at www.tudelft.nl/tisd |

### 2.4 Education (Ed1/Ed2)

Coordinator: M.A.F.M. Jacobs.
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 specialisation 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 during the bachelor programme and leads to certification as a tweedegraads secondary school teacher with limited qualification (beperkte bevoegdheid). If a student has done the minor Education, only the Verdiepingsdeel/Ed2 of 30 EC remains for the master programme specialisation. The combination of the minor Education and Ed2 specialisation leads to certification as a fully-qualified eerstegraads (grade-one) secondary school teacher. The certificate will be attached to the master diploma.
Students that did not take the minor Education can follow the Basisdeel/Ed1 specialisation as part of their master programme and then do the Verdiepingsdeel/Ed2 as a post-master course in order to become fully qualified.
The programme should be approved by coordinator.

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| **30 EC Education - Basisdeel (Ed1)**<br>SL3031, Didactical Skills, 3EC<br>SL3041, Orienterende Stage, 3EC<br>SL3111, Research Methodology in Social Sciences, 3EC<br>SL3121,Didactics Physics 1, 3EC<br>SL3164, Field Orientation Physics A, 9EC<br>SL3331, Didactics Physics 2, 3EC<br>SL3462, Educational Science, 6EC |
| **30 EC Education - Verdiepingsdeel (Ed2)**<br>SL3012, Integration SC/SE, 3EC<br>SL3021, The Designing of Communication and Education Products, 6EC<br>SL3311, Research of Education, 6EC<br>SL3371, Didactics Physics 3, 3EC<br>SL3414, Field Orientation Physics B, 12EC<br>If, due to changes in the programmes, SL3111 (Research Methodology in Social Sciences, 3EC) has not been done as part of the minor or basisdeel, it has to be done additionally for the certification as a fully-qualified eerstegraads (grade-one) secondary school teacher. |

### 2.5 Management of Technology (MoT)

Coordinator: dr. W.M. de Jong

This specialisation 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 is a coherent set of modules that is approved by the MoT programme coordinator in advance.

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| **1st SEMESTER MoT Modules (30 EC)**<br>MOT1001, Integration Moment I, 4EC<br>MOT1411, Technology Dynamics, 4EC<br>MOT1420, Economic Foundations, 6EC<br>MOT1460, Corporate Finance, 4EC<br>MOT1523, Leading and Managing People, 4EC<br>MOT1530, High-tech Marketing, 4EC<br>MOT2311, Quantitative Research Methods, 4EC |
| **2nd SEMESTER MoT Modules (30 EC)**<br>MOT1002, Integration Moment II, 4EC<br>MOT1432, Technology and Strategy, 6EC<br>MOT1440, Philosophy of Science, 3EC<br>MOT1450, Decision Making, 6EC<br>MOT2420, Innovation Management, 6EC<br>MOT9511, Advanced Project Management, 5EC |

### 2.6 Annotation in Entrepreneurship (AE)

Coordinator: Drs. S.C. Tate

The student makes a proposal for the courses to be followed and for the final thesis and will discuss the proposal with the coordinator of the Delft Centre for Entrepreneurship (DCE) and a coordinator from the faculty. The programme should be approved by the programme coordinator.
An Annotation in Entrepreneurship certificate will be granted during the graduation ceremony.

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| **2 EC** Entrepreneurship Annotation Week (WM4001TU). |
| **8 EC** Annotation Entrepreneurship Final Thesis (WM4003TU). |
| **14 EC** Modules on Entrepreneurship, suggestions:<br>ID4315, New Product Commercialization, 6EC |

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| ID5600SET, Smart Energy Products, 4EC<br>MOT9556, Corporate Entrepreneurship, 6EC<br>WM0506TU, Writing a Business Plan, 6EC<br>WM0516TU, Turning Technology into Business, 6EC<br>WM0521TU, Business Analysis of Entrepreneurship, 6EC<br>WM0560TU, Essentials of Technology-Based Business, 4EC<br>WM0563TU, Starting New Ventures, 3EC<br>WM0617TU, Introduction to High Tech Marketing, 4EC<br>WM0625TU, Innovation Management, 4EC |
| **6 EC Free Elective**<br>Either an additional module on Entrepreneurship, or a regular Applied Physics G-,D-,R- or M-list module. |

### 2.7 Nuclear Science and Engineering (NSE)

Coordinator: dr.ir. M. Rohde

Nuclear Science and Engineering has to be a core issue in the graduation project and the internship. Approval of the thesis work and the internship by the coordinator is required. Nuclear Science and Engineering may have a focus on either "health" or on "energy".

An NSE certificate will be granted during the graduation ceremony.

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| **18 EC internship** (AP3911) |
| **12 EC NSE electives**<br>6EC to be approved by the master thesis supervisor from these lists.<br>6EC free choice from these lists.<br><br>**General NSE Modules**<br>AP3311D, Neutrons, X-Rays and Positrons for Studying Microscopic Structures and Dynamics, 6EC<br>AP3371D, Radiological Health Physics, 6EC<br>CH3581, Nuclear Materials, 3EC<br>CH3762, Practical Radiochemistry, 3EC<br>CH3771, Nuclear Chemistry, 6EC<br>CH3792, Nuclear Science, 3EC<br><br>**NSE Energy Modules**<br>AP3321, Special Topics in Nuclear Reactor Physics, 6EC<br>AP3341D, Nuclear Reactor Physics, 6EC<br>AP3631, Kinetics of Nuclear Reactors, 3EC<br>AP3641, Nuclear Reactor Thermal Hydraulics, 3EC<br>CH3782, Chemistry of the Nuclear Fuel Cycle, 3EC<br>WB4416, Nuclear Engineering, 3EC<br><br>**NSE Health Modules**<br>AP3241, Particle Therapy Holland PTC - General & technical Aspects, 6EC<br>AP3351D, Radiation Detection and Medical Imaging, 6EC<br>AP3361TU, Medical Physics & Radiation Technology: Imaging, 6EC<br>AP3581TU, Medical Physics & Radiation Technology: Radiotherapy, 6EC |

### 2.8 Casimir specialisation

This specialisation implies participation in the special Pre-PHd programme described in detail in subsection 3.2. A selection procedure takes place before entrance into this special programme.

## Article 3 Special programmes

### 3.1 The Erasmus Mundus programme Optics in Science and Technology (OpSciTech)

Coordinator: Dr. F. Bociort.

This programme is an Erasmus Mundus programme jointly given by TU Delft and partner universities, i.e. Friedrich Schiller University Jena (Germany), Université Paris-Sud 11/Institut d'Optique Graduate School (Paris, France), Warsaw University of Technology (Poland) and Imperial College London (United Kingdom). The course consists of one year spent at Delft University of Technology and one year spent at one of the partner universities. Each year students must complete 60 EC.

The **first year** of the EMM programme TU Delft consists of:

**Obligatory Modules, 30 EC:**

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| WI4243AP, Mathematical Methods for Physics, 9EC |
| WM0320TU, Ethics and Engineering, 3EC |
| AP3071G, Advanced Electrodynamics, 6EC |
| AP3941, Internship Optics Research Group, 12EC |

**Electives, 30 EC:**

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|---|
| AP3061D, Advanced Wave Propagation, 6EC |
| AP3111D, Quantum Electronics and Lasers, 6EC |
| AP3121D, Imaging Systems, 6EC |
| AP3231D, Medical Imaging, 6EC |
| AP3361, Medical Physics & Radiation Technology: Imaging, 6EC |
| AP3381, Theoretical Optics, 6EC |
| AP3391, Geometrical Optics, 6EC |
| AP3401, Introduction to Charged Particle Optics, 6EC |
| AP3601, Optical Fabrication Technology, 6EC |
| AP3671D, Optical Wave Guiding, Photonic Crystals and Optical Functions, 6EC |
| ET4283, Advanced Digital Image Processing, 6EC |
| IN4085, Pattern Recognition, 6EC |

The **second year** of the EMM programme TU Delft consists of:

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| **48 EC** Master's Thesis Work (AP3091) |
| **12 EC** Modules from the G, D, R or M list that must be approved by the master thesis supervisor. |

### 3.2 Casimir pre-PhD special programme

Coordinator: Dr. A.F. Otte

This programme focuses on preparing and educating MSc students for a PhD position within the Leiden Institute of Physics (LION) or the Kavli Institute of nanoscience (or elsewehere). It is also designed to respond to the increased mobility of students after their BSc and entering an 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 for Nanoscience in Delft and the Leiden Institute of Physics (LION). The research within the school is grouped into 6 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 first examination period in January, a special committee consisting of staff members from both Leiden and Delft decides on definite admission into the programme. Students who are declined can continue with the regular AP programme without incurring delays.
For a limited number of students completing this special programme successfully, a PhD position is guaranteed. In order to qualify for one the PhD positions, students should 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:**

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|---|
| WI4243AP, Mathematical Methods for Physics, 9EC |
| WM0320TU, Ethics and Engineering, 3EC |

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

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| AP3021G, Advanced Statistical Mechanics, 6EC |
| AP3051G, Advanced Quantum Mechanics, 6EC |

- **One course from the 'Foundational' list, 6-9 EC:**

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| AP3681, Fairy Tales of Theoretical Physics, 6EC |
| UL-EFT, Effective Field Theory, 3EC |
| UL-QFT, Quantum Field Theory, 6EC |
| UL-QOQI, Quantum Optics and Quantum Information, 9EC |
| UL-TCM, Theory of Condensed Matter, 9EC |
| UL-TGR, Theory of General Relativity, 6EC |
| UL-TTP, Topics of Theoretical Physics, 9EC |

- **Two courses from the 'Topical' list, 12 EC:**

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| AP3161D, Cellular Dynamics: Stochasticity and Signalling, 6EC |
| AP3191D, Physics of Semiconductor Nanodevices, 6EC |
| AP3211D, Advanced Solid State Physics, 6EC |
| AP3261D, Mesoscopic Physics, 6EC |
| AP3271, Molecular Electronics, 6EC |
| AP3281D, Quantum Transport, 6EC |
| AP3291, Quantum Information Processing, 6EC |
| AP3511D, Molecular Biophysics, 6EC |
| AP3661, Quantum Entanglement, 6EC |
| UL-AB, Advanced Biophysics, 6EC |
| UL-APP, Introduction to Astro-Particle Physics, 6EC |
| UL-ECQO, Experimental Classical and Quantum Optics, 6EC |
| UL-SMO, Single Molecule Optics, 6EC |
| UL-SP, Surface Physics, 6EC |

- **One course from the 'Methods' list, 6 EC:**

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| AP3081D, International Masters Course on Computational Physics, 6EC |
| AP3221D, Nanotechnology, 6EC |
| AP3651, Electronics for Physicists, 6EC |

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| UL-CP, Computational Physics, 10EC |
| UL-PSSI, Physics of Scientific Space Instruments, 6EC |
| UL-SPM, Scanning Probe Microscopy, 6EC |

- **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), to be carried out in different group, and in a different group than where the 36 EC Research project takes place.
- **Writing a research proposal** (AP3952, 8EC), possibly based on the large or on the smaller research projects.
- The remaining EC's (9-12) are filled with **elective modules** from the topical, foundational or methods lists; 6 EC must be agreed upon by the supervisor of the long research project.

### 3.4 Honours track

The Honours Track consists of 30 EC on top of the regular master programme of 120 EC. The full Applied Physics programme including the additional honours track should be finished within the standard two years. It is an individual programme which contains 10 EC specially developed courses for all TU Delft honours track students plus a 20 EC coherent package of challenging courses.
Access to the honours track and the programme of the honours track should be submitted tot the Board of Examiners after approval by the Applied Physics' programme director Dr. J.M. Thijssen.

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| **Collective Part (10 EC)**<br>WM0355HT, Critical Reflection on Technology, 5EC, obligatory<br>WM0333TU, Climate Change: Multidisciplinary Perspective, 5EC<br>WM0360HT, Creativity in science and design, 5EC |
| **Individual Part (20 EC)** |

### 3.5 Double degree programme Applied Physics – Management of Technology[2]

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 specialisation 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. Access to this double degree programme is decided upon by the Board of Examiners after approval by Applied Physics' programme director Dr. J.M. Thijssen and MoT coordinator Dr. W.M. de Jong. The programme consists of:

| **Programme** | **EC** |
|---|---|
| The AP Core Programme | 90 |
| The AP Specialisation MoT / 1st semester MoT modules (list of modules in art. 2.5) | 30 |
| 2nd semester MoT modules (list of modules in art. 2.5) | 30 |
| Advised, but not required: Integration Moment III (MOT2002) | 4 |
| MoT MSc Thesis Project (MOT2910) | 30 |

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

[2] More generally, double degree programmes combining applied physics with other master courses taught at 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 permission from the deans of the faculties is required in advance.

## Section 2 ADMISSIONS

### Article 4 Admissions

For admissions see article 5 of the Teaching and Examination Regulations

**Applicants from other institutions**

Applicants from other institutions seeking admission to the MSc programme in Applied Physics must, in most cases, possess a Bachelor of Science degree in either Physics or Applied Physics, or have met the standard requirements thereof.
Students holding a Bachelor of Science degree in Applied Physics from the universities of Delft, Eindhoven, Groningen, Twente and IDEA-league partners will be admitted.
Students holding a Bachelor of Science degree in physics from a Dutch (general) university are admitted, however, depending on the department of their choice, they may be required to do some BSc modules as part of their Master programme.
The admission of students from foreign BSc (Applied) Physics programmes will be decided upon by the admissions officer of the Applied Physics master. University-wide requirements concerning minimum GPA (Grade Point Average) and/or GRE (Graduate Record Examination) in addition to minimum scores for either TOEFL or IELTS tests on English proficiency, apply to all applicants.

**Bridging programmes**

Students holding a Bachelor of Science degree in Chemical Engineering, (Applied) Mathematics, Electrical Engineering, Aeronautical Engineering or Mechanical Engineering from a Dutch (Technical) University may apply, but, if admitted, will be required to follow a bridging programme to provide them with the required background to allow them to complete the Master's programme. The bridging programme is decided upon by the Director of Education on an individual basis.

A maximum of 18EC of any bridging programme can be incorporated in the Master's programme.

The same applies to students holding a Bachelor of Engineering degree in Physics Engineering, from a Dutch University of Professional (Technical) Education. For students from the Haagse Hogeschool holding a Bachelor degree in applied physics, the bridging programme is fixed (see below for details).

| |
|---|
| TN2053, Electromagnetisme 1, 6EC |
| TN2301, Inleiding Kwantummechanica, 3EC |
| TN2311, Kwantummechanica A deel 1, 3EC |
| TN2345, Inleiding Golven, 3EC |
| TN2421, Optica, 3EC |
| TN2545, Systemen en Signalen, 6EC |
| TN2953SK, Research Practicum, 2EC |
| WI1142TN, Lineaire algebra deel 1, 3EC |
| WI2140TN, Differentiaalvergelijkingen, 4EC |
| WI2242TN, Lineaire algebra deel 2, 3EC |

TN2053, TN2311, TN2421 and TN2545 can be incorporated in the Master's programme. After completing the other bridging modules a student will be admitted in the master programme.

## Section 3 EXAMINATIONS

## Article 5 Order of the exams

### 5.1 Graduation Project, Master's thesis

You may start your Master Thesis Project if you:

- have been admitted to the master programme Applied Physics,
- have passed needed bridging modules or other obligations from the bachelor programme,
- have passed all obligatory (12EC), G-list (12 EC) and D-list (12EC) modules,
- have made a project plan with your thesis supervisor; this project plan should be handed in at enrollment.
- The date and time of the master project presentation is determined by the thesis supervisor, after hearing the student. In exceptional cases, the programme director may be involved in setting this date and time.

### 5.2. Practical laboratory work

In order to be allowed to do practical laboratory work, students must have completed the course in laboratory safety or an equivalent thereof. At the start of the final project, the appropriate registration form *must* be filled in and handed in at the thesis project office.

### Article 6 Protocol for Graduation projects

6.1 The programme is concluded by fulfilling a final assignment and presenting a Master's thesis.
6.2 The Master's thesis is assessed by a thesis Board of Examiners, as laid down in art 27 of the Rules and Guidelines of the Board of Examiners.
6.3 The student applying for the Master's degree audit has to defend his thesis before the thesis Board of Examiners mentioned in 6.2.
Further rules governing the MSc graduation projects can be found in article 26 to 29 of the Rules and Guidelines of the Board of Examiners

### Article 7 The form of the examinations and the methods of assessment

The form of the examinations and the methods of assessment are described in the (digital) study guide.

## Section 4 Flexible Study programme

### Article 8 Composing a flexible study programme

8.1 A master student may compile a curriculum to which an examination is connected. The curriculum must consist entirely, or essentially, of curriculum units that are taught for the benefit of his/her own instruction and may be completed with curriculum units that are required by another curriculum and/or by other institutions of scientific education. The curriculum must comply with the final attainment levels of the institution to which the application is submitted.
8.2 The curriculum mentioned in 8.1 shall be accompanied by a motivation of choice and shall be submitted to the Board of Examiners for approval.

## Section 5 Additional Rules

### Article 9 Transition ruling

The core programme described in article 1 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 WI4243AP 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 is part of a student's programme WI3150TU, WI4014TU, WI4143TN, and WI4150TU can't be chosen as optional modules.

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-lists.

**Equivalences:**
NS3501 = AP3221 Nanotechnology, 6EC
NS3511 = AP3511 Biophysics, 6EC
NS3521 = AP3261 Mesoscopic Physics, 6EC
NS3531 = AP3271 Molecular Electronics, 6EC
NS3571 = AP3281 Quantum Transport, 6EC
NS3621AP = AP3291 Quantum Information Processing, 6EC
TN2881 = AP3251-UL = UL-TGR Theory of General Relativity, 6EC

WM0922TU, 4EC = WM0939TU, 5EC. Difference in EC to be compensated by TiSD electives.

### Article 10 Degree supplement

An overview of the study modules taken is given on the certificate. The degree supplement is issued in English.

### Article 11 Date of commencement

This regulations will come into effect on 5 September 2011.