

NVAO • THE NETHERLANDS

INITIAL ACCREDITATION

HBO-MASTER

APPLIED QUANTUM TECHNOLOGY (JOINT
DEGREE)

Amsterdam University of Applied Sciences,
Fontys University of Applied Sciences,
Saxion University of Applied Sciences, and
The Hague University of Applied Sciences

SUMMARY REPORT

6 JANUARY 2025

1 Peer review

The quality of a new programme is assessed by means of peer review. A panel of independent peers including a student reviews the plans during a site visit to the institution. A discussion amongst peer experts forms the basis for the panel's final judgement and the advisory report. The focus is on the curriculum, the teaching and learning environment, and student assessment.

The Accreditation Organisation of the Netherlands and Flanders (NVAO) takes a formal decision on the quality of the new programme based on the outcome of the peer review. This decision can be positive, conditionally positive or negative. Following a positive NVAO decision with or without conditions the institution can proceed to offer the new programme. Upon completion of the programme graduates are entitled to receive a legally accredited degree.

This summary report contains the main outcomes of the peer review. A full report with more details including the panel's findings and analysis is also available. NVAO bases an accreditation decision on the full report.

Both the full and summary reports of peer reviews are published on NVAO's website www.nvao.net. There you can also find more information on NVAO and peer reviews of new programmes.

2 Panel

Peer experts

Prof. dr. M.J. (Margriet) Van Bael (chair), full professor at the Department of Physics and Astronomy also Vice Dean of Education of the Faculty of Science at KU Leuven (Belgium)

Dr. P.J.S. (Peter) van Capel (member), assistant professor/ practical Leader at the Julius Institute, Department of Physics, Faculty of Science, Universiteit Utrecht (the Netherlands)

Dr. Ing. A. (Alessandro) Bruno (member), CTO at QuantWare B.V., Delft (the Netherlands)

S. (Simon) Veld BSc (student-member), student MSc Technical Medicine at the University Twente (the Netherlands)

Assisting staff

Drs. Miranda Valkenburg (secretary)

Eva de Haan MSc MEd (secretary)

Anne Klaas Schilder MA (NVAO policy advisor and process coordinator)

Site visit

Amsterdam, 20 November 2024

3 Outcome

The NVAO approved panel reaches a positive conclusion regarding the quality of the master programme Applied Quantum Technology (joint degree) offered by Amsterdam University of Applied Sciences, Fontys, Saxion, and The Hague University of Applied Sciences. The programme complies with all standards of the limited NVAO framework.

The master Applied Quantum Technology (AQT) is a professional two-year master programme that specialises in quantum technologies. Students will become quantum professionals with advanced knowledge in one of the three application fields: the electronic quantum engineer, the photonics quantum engineer and the software quantum engineer. The master is a joint degree between four applied universities which have signed a cooperation agreement. The intention of the four partners is to distribute efforts equally between them.

The proposed curriculum for the AQT programme is extensive and complete and covers the intended learning outcomes. The panel finds that the intended learning outcomes are well described and meet the national and international standards for a professional master on quantum technology. The curriculum has explicit attention for professional skills and has a strong connection to industry. The graduation project with a load of 45 EC will enable students to have an in-depth applied research experience during their studies. This further solidifies the strong applied quantum engineer profile of AQT graduates.

The master AQT is run by a group of enthusiastic and professional lecturers. Most lecturers have a research appointment as well. This connects the master AQT to the rapidly evolving research within the realm of quantum technology. The programme also fosters a close connection to industry by the applied nature of the courses, by the internship or end project and by the involvement of the industry advisory board. The panel agrees that the English language as the language of instruction is the logical choice for the AQT programme. Textbooks and articles on quantum engineering are almost exclusively available in English and the work field is strongly internationally oriented. The programme intends to welcome international students, making English the necessary daily language of the programme.

The proposed duration for the AQT programme is two years (120 EC). The panel agrees with the applicants that the extent and complexity of the master programme cannot be achieved in one year. Students come into the programme from different backgrounds and need time to get acquainted with the other disciplines within the programme and with the foundations of quantum technology. After this, students need to specialize and get sufficient practical experience to reach the master level. The panel therefore recommends granting the applicants the right to offer the AQT master as a two-year master programme.

Through the information in the information dossier and the extensive discussions during the site visit, the panel concludes that the AQT master meets the quality level required by NVAO. The panel is convinced of the quality of the proposed AQT programme and assesses it as positive.

4 Commendations

The programme is commended for the following features of good practice.

1. Skilled and passionate staff: All four applied universities appoint existing staff members to the programme who are skilled and passionate in both education and applied research. The research expertise of the lecturers helps to bridge the gap between education and applied use of quantum knowledge in research and industry.
2. Close collaboration with industry: The industry need for graduates in quantum technology is clear. Industry partners within the domain of quantum technology have been asked for feedback on the curriculum and regular contacts and advice will be established through the industry advisory board. They will also supervise internship projects and are closely connected to the students in the final phase of their programme.

3. Facilities for students: Students use facilities in all four locations of the programme. They can benefit from the facilities that are closest to them, but also from the expertise of the other applied universities. This concerns both technical lab facilities as well as facilities in student support.

4. Examinations Board: The panel commends the programme for the fact that each applied university is represented by a member within the Examinations Board. This will help students and staff at each location to have a close point of contact to the Examinations Board. The Examinations Board has knowledge of all the different local procedures and regulations.

5. Uniform online student environment. The programme will use a single online student environment. This uniformity will enable students to have all the study information in one place despite having different physical locations.

6. Mentor for students: Students will be appointed a mentor, who can help navigate the complexities of a joint degree on multiple locations.

5 Recommendations

For further improvement to the programme, the panel recommends a number of follow-up actions. These recommendations do not detract from the positive assessment of the programme's quality.

1. Travel time and costs for students – Minimise travel time and costs for students where possible and communicate realistic travel time and costs to prospective students.
2. Guidelines for the use of generative AI – Develop and communicate clear policy on the use of generative AI within the programme in both education and assessment.
3. Fostering student community – Emphasize community building across all locations. Because students live far from each other it is extra important to foster a sense of community across and between all locations.
4. Attention for diversity and inclusion – Diversity and inclusion should receive sustained attention from admission to graduation.
5. Harmonizing student support – Harmonize the application process for extra facilities for students with extra support need across locations and communicate this clearly to students.
6. Industry Advisory Board - Represent all three orientations and all regions within the industry advisory board.

6 What comes next?

NVAO grants initial accreditation to a new programme on the basis of a panel's full report. The decision is valid for a maximum of six years. For conditional accreditation other regulations apply. Upon accreditation the new programme will follow the NVAO review procedures for existing programmes. NVAO publishes the accreditation decision together with the full report and this summary report. ¹

Each institution has a system of quality assurance in place ensuring continuous follow-up actions and periodic peer-review activities. Peer reviews help the institution to improve the quality of its programmes. The progress made since the last review is therefore taken into consideration when preparing for the next review. The follow-

¹ <https://www.nvao.net/nl/besluiten>

up activities are also part of the following peer-review report. For more information, visit the institution's website.²

7 Summary in Dutch

Het panel oordeelt positief over de kwaliteit van de hbo-master Applied Quantum Technology (joint degree) van Hogeschool van Amsterdam, Fontys Hogeschool, Hogeschool Saxion, en De Haagse Hogeschool. Dit is de uitkomst van de kwaliteitstoets uitgevoerd door een panel van peers op verzoek van de Nederlands-Vlaamse Accreditatieorganisatie (NVAO). Voor deze beoordeling heeft het panelgesprekken gevoerd met de opleiding op 20 november 2024.

De master Applied Quantum Technology (AQT) is een professioneel, tweejarig masterprogramma dat zich specialiseert in kwantumtechnologie. Studenten worden opgeleid tot kwantumprofessionals met geavanceerde kennis in een van de drie toepassingsgebieden: de elektronica-kwantumingenieur, de fotonica-kwantumingenieur en de software-kwantumingenieur. De master is een gezamenlijk programma van vier hogescholen die een samenwerkingsovereenkomst hebben getekend en waarin de vier partners een gelijkwaardig bijdrage leveren in de organisatie.

Het voorgestelde curriculum is uitgebreid en volledig en dekt de beoogde leeruitkomsten. Het panel vindt dat de beoogde eindtermen goed beschreven zijn en voldoen aan de nationale en internationale standaarden voor een professionele master in de kwantumtechnologie. Het curriculum heeft expliciete aandacht voor professionele vaardigheden en heeft een sterke verbinding met het bedrijfsleven. Tijdens de gesprekken van het panel met de aanvragers is het onderwerp van reistijd en reiskosten aan bod gekomen. Omdat studenten moeten reizen tussen de verschillende locaties, adviseert het panel om het reizen zoveel mogelijk te minimaliseren en hierover duidelijk te communiceren met (aanstaande) studenten.

De master wordt geleid door een groep enthousiaste en professionele docenten. De meeste docenten hebben ook een onderzoeksaanstelling. Dit verbindt de master met het snel evoluerende onderzoek in het domein van de kwantumtechnologie. Het programma is nauw verbonden met het bedrijfsleven door het toegepaste karakter van de cursussen, door de stage en het eindproject en door de betrokkenheid van een industriële adviesraad met leden uit het bedrijfsleven. Gezien het internationale karakter van de opleiding steunt het panel het Engels als voertaal en de Engelstalige naam voor de opleiding. Studiemateriaal over kwantumonderwerpen is vrijwel uitsluitend in het Engels beschikbaar en het werkveld is sterk internationaal georiënteerd. Het programma wil internationale studenten verwelkomen, waardoor Engels de noodzakelijke voertaal van het programma wordt.

De voorgestelde duur van de master is twee jaar (120 EC). Het panel is het met de aanvragers eens dat de omvang en complexiteit van het masterprogramma niet in één jaar kan worden gerealiseerd. Studenten starten aan het programma vanuit verschillende achtergronden en hebben tijd nodig om kennis te maken met de andere disciplines binnen het programma en met de fundamentele van kwantumtechnologie. Daarna moeten studenten zich specialiseren en voldoende praktijkervaring opdoen om het masterniveau te bereiken. Het panel adviseert daarom de aanvragers het recht te verlenen om de master AQT als tweejarige masteropleiding aan te bieden.

Door de informatie in het informatiedossier en de uitgebreide gesprekken tijdens het locatiebezoek concludeert het panel dat master AQT voldoet aan het door de NVAO vereiste kwaliteitsniveau. Het panel is overtuigd van de kwaliteit van de voorgestelde opleiding en beoordeelt deze als positief.

Meer informatie over de NVAO-werkwijze en de toetsing van nieuwe opleidingen is te vinden op www.nvaonet.nl. Voor informatie over de Hogeschool van Amsterdam verwijzen we naar de website van de instelling.³

²<https://www.amsterdamuas.com/> | <https://www.fontys.nl/en/Home.htm> | <https://www.saxion.edu/> | <https://www.thuas.com/>

³<https://www.hva.nl/> | <https://www.fontys.nl/Home.htm> | <https://www.saxion.nl/> | <https://www.dehaagsehogeschool.nl/>

The summary report was written at the request of NVAO and is the outcome of the peer review of the new programme Applied Quantum Technology (joint degree) of Amsterdam University of Applied Sciences, Fontys University of Applied Sciences, Saxion University of Applied Sciences, and The Hague University of Applied Sciences

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