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Quantum for the Curious: An academic minor to enhance quantum literacy for non-physics students

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Abstract
The quantum industry demands a diverse workforce with foundational quantum knowledge, extending beyond traditional physics specialists. To address this, the University of Twente developed Quantum for the Curious, a 15 ECTS minor introducing non-physics students to key quantum phenomena and technologies. Guided by the European Competence Framework for Quantum Technologies, the minor enhances scientific literacy and industry-relevant competencies. This talk introduces the minor, launched in 2024-2025, outlining its structure, objectives and key features. It will briefly reflect on highlights from the first year, including a lecture on cryogenics, and share initial impressions based on student feedback.

Introduction
The quantum industry requires a diverse and balanced workforce to enable its expected growth. People with a basic understanding of quantum physics principles can support the workforce, including those not directly involved in quantum technology development. [1,2] Their knowledge can aid decision-making processes, contribute to effective communication around quantum technologies, and assist in the design of related products. [3] It is a relevant educational pursuit across research and industry.

With this in mind, we developed a new minor program on quantum technology at the University of Twente, named 'Quantum for the Curious'. [4] A minor is a package of courses of usually 15 ECTS, which allows students to specialise or broaden their knowledge and competencies. The minor introduces non-physics students to key quantum physics concepts and emergent quantum technologies and applications. The minor promotes scientific literacy in quantum physics and provides essential knowledge and skills for industries increasingly using quantum technologies.

We designed the minor explicity for non-physics students, aiming to spark interest in quantum physics while exploring its emerging applications and technologies. Students are expected to master basic skills in linear algebra.

Design of the minor
We designed the minor Quantum for the Curious using the European Competence Framework for Quantum Technologies [5]. The framework defines three proficiency areas, namely (I) Quantum Concepts, (II) Quantum Technology hardware & software engineering, and (III) Quantum Technology applications & strategies. We' ve designed a 5 ECTS course for each proficiency area.

In the course "Quantum Concepts", the physics concepts behind quantum technology are introduced. Topics addressed are superposition, quantisation, entanglement, qubit states, operators, time-evolution and technology platforms.

The course "Quantum Technology Hardware and Software Engineering"addresses different enabling technologies, such as cryogenics, cleanroom technology, and measurement equipment. The students work on three experimental assignments: Quantum Key Distribution, Bell inequality violation, and NV-center qubits. Furthermore, the students work on two software assignments: quantum teleportation and a quantum algorithm.

The "Quantum Technology Applications and Strategies"course introduces different applications, business strategies, policies, didactics, and ethics. The students work in teams on a quantum project given by industrial or academic partners.

Oral presentation
This talk presents an overview of the minor Quantum for the Curious, which was launched in the academic year 2024-2025. I will outline the structure and objectives of the programme and highlight some distinctive features. Among these was a lecture on cryogenics, an enabling technology crucial to the functioning of many quantum systems. Drawing on student feedback and reflections, I will share some impressions on how the minor was received, and discuss ideas for further development.

References
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