

# PhD Course on Quantum Computing

a.y. 2018/2019

Quantum computation is becoming of greater and greater interest in computer science, mathematics, physical sciences and engineering. Quantum computers could soon provide breakthroughs in many disciplines, including the simulation and optimisation of complex systems, material design and drug discovery, and artificial intelligence. Already now, quantum computers are no longer objects merely described in books, as they have been realised in practice and open access to quantum chips has been made available by some companies (i.e. IBM, Rigetti). Quantum computers will likely lead to new avenues of technological innovations in communication, computation and cryptography. But to realise those breakthroughs, and to make quantum computers widely useable and accessible, we need to reimagine information processing and the machines that do it, and to reinvent new ways of coding. More than with an increase in computation speed, Quantum Computing deals with a severe change of paradigm.

The course aims at providing an introduction to Quantum Computing from the theoretical bases to main applications. It is addressed to PhD students in Physics and related areas (Mathematics, Engineering, Computer Science, Chemistry) who wish to receive an introduction to the concepts and terminology used in Quantum Computing, to become familiar with the structure and operation of a Quantum Computer, and to understand the basic concepts of quantum programming.

**C. Macchiavello (UniPV) - Theoretical basis** (*lecture, 6 hours*)

- 3-4-5 December 2018, 10:00-12:00

**D. Gerace (UniPV) - Universal quantum simulators** (*lecture, 6 hours*)

- 15-16 and 22 January 2019, 10:00-12:00

**I. Tavernelli (IBM, Zürich) - Superconducting qubits** (*lecture, 8 hours*)

- 12-13 February 2019, 10:00-12:00 and 15:00-17:00

**D. Bajoni (UniPV) - Photonic quantum simulators** (*seminar, 2 hours*)

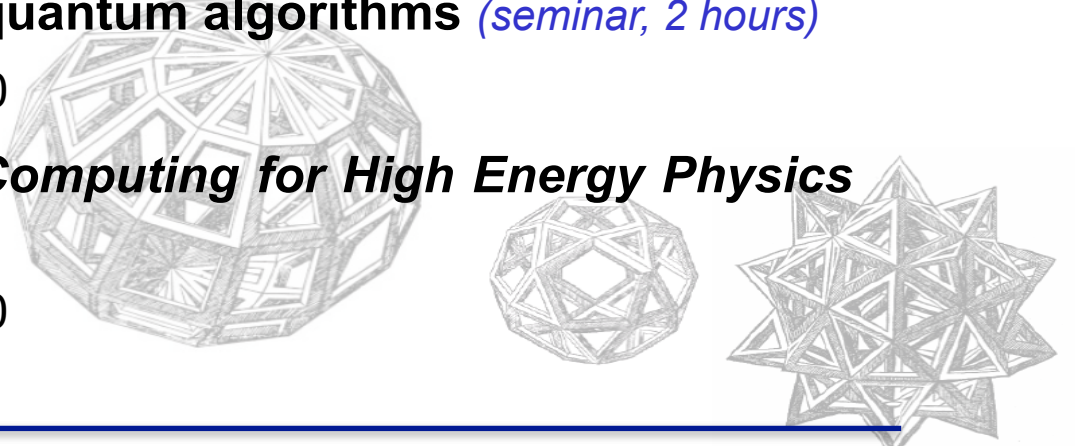
- 23 January 2019, 10:00-12:00

**J. I. Latorre (Barcelona) - Hybrid quantum algorithms** (*seminar, 2 hours*)

- 14 February 2019, 10:00-12:00

**F. Carminati (CERN) - Quantum Computing for High Energy Physics Applications** (*seminar, 2 hours*)

- 21 February 2019, 10:00-12:00



Lectures will be given in the Aula Dottorato Physics Department, Via Bassi 6, Pavia

Please register at <http://fisica.unipv.it/dottorato/corso-quantum-computing.htm>.

For further details, contact the course responsible ([daniela.rebuzzi@unipv.it](mailto:daniela.rebuzzi@unipv.it)) or the PhD Coordinator ([lucio.andreani@unipv.it](mailto:lucio.andreani@unipv.it)).