Course : Quantum computing, the new business challenges

Seminar - 1d - 7h00 - Ref. IQP
Price : 1100 CHF E.T.

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In just a few years' time, quantum computing could open up new possibilities for business applications. Complex simulations, combinatorial calculations, the applications are impressive, in the fields of transport, finance, health, communications... Few sectors will be spared by this new generation of computers. This seminar introduces you to these new potentials, their impacts and how to prepare your roadmap. In 2019, quantum computing is out of the laboratories. By 2020, it will be in business.

Teaching objectives

At the end of the training, the participant will be able to:

- Understanding the basics of quantum computing
- Understanding potential business applications
- Discover the panorama of hardware and software solutions
- Draw up a roadmap (training, simulation, prototypes)

Intended audience

General management, strategic and intelligence departments, IT departments.

Prerequisites

No special knowledge required.

Course schedule

PARTICIPANTS

General management, strategic and intelligence departments, IT departments.

PREREQUISITES

No special knowledge required.

TRAINER QUALIFICATIONS

The experts leading the training are specialists in the covered subjects. They have been approved by our instructional teams for both their professional knowledge and their teaching ability, for each course they teach. They have at least five to ten years of experience in their field and hold (or have held) decision-making positions in companies.

ASSESSMENT TERMS

The trainer evaluates each participant's academic progress throughout the training using multiple choice, scenarios, hands-on work and more.
Participants also complete a placement test before and after the course to measure the skills they've developed.

TEACHING AIDS AND TECHNICAL RESOURCES

• The main teaching aids and instructional methods used in the training are audiovisual aids, documentation and course material, hands-on application exercises and corrected exercises for practical training courses, case studies and coverage of real cases for training seminars.
• At the end of each course or seminar, ORSYS provides participants with a course evaluation questionnaire that is analysed by our instructional teams.
• A check-in sheet for each half-day of attendance is provided at the end of the training, along with a course completion certificate if the trainee attended the entire session.

1 Understanding the challenges of quantum computing

- Why not probably buy a quantum computer... you'll be using one within the next 5 years.
- Some basics of quantum physics: the concepts of superposition and entanglement.
- From traditional computing to quantum computing: from bits to qubits.
- The concept of quantum supremacy, the tipping point between traditional and quantum computing.
- States are investing massively: China, the United States, Russia, Canada, France, the United Kingdom, the Gulf States...
- From the Electronic Numerical Integrator Analyser and Computer (ENIAC) to the first quantum computers.
- The challenges of creating a quantum computer: why is it so complex?
- Potential market figures: compilation of major analyst studies.
- Key components of a quantum computer: qubits, processor, quantum gates, error correction, etc.
- The architecture of a quantum computer, current constraints on energy consumption and cost.
- Quantum computing "as a Service", in the cloud, and accessible through a platform.
- High-Performance Computing (HPC), quantum simulator, neuromorphic chips.
- Complementarity and preparation for the development of quantum computing.
- Quantum algorithms: how do they differ from traditional algorithms?

2 First applications by sector

- Overview of the first use cases by sector.
- Finance, transport, communications, healthcare, energy... take a look at the companies investing in quantum computing.
- Financial system security, how RSA and AES algorithms could become obsolete, just like blockchain...
- Why and how can we develop new quantum encryption systems?
- Special case: the defense industry - how quantum computing and telecommunications represent global geostrategic issues.
- The cost of a first prototype: how to calculate it and assess the return on investment?
- Quantum computing for artificial intelligence, machine learning, deep learning and big data.
- How to position the various complementary technologies: HPC, supercomputers, cloud computing.
- Presentation of a maturity model to position your company.
- How to prepare a proof of concept, and identify a problem to be solved in your organization.
- Initial feedback from companies that have invested in quantum computing. What problems need to be solved?

TERMS AND DEADLINES

Registration must be completed 24 hours before the start of the training.

ACCESSIBILITY FOR PEOPLE WITH DISABILITIES

Do you need special accessibility accommodations? Contact Mrs. Fosse, Disability Manager, at psh-accueil@orsys.fr to review your request and its feasibility.

3 Overview of market players: hardware and software trends

- Hardware (Google, IBM, Microsoft, Alibaba, Amazon, Intel, Fujitsu, Rigetti, D-Wave, Quantum Computing Inc., etc.).
- The latest technologies: Microsoft Majorana, D:Wave Advantage, Nvidia, Google Willow, IBM Universal Quantum, Baidu...
- France's leading quantum start-ups: Quandela, Pasqal, Alice & Bob...
- Techniques and methods for developing quantum algorithms using languages such as Microsoft's Q# or IBM's Qiskit.
- Programming differences with traditional languages.
- Simulation solutions and software platforms.
- An overview of the universities we work with.
- An overview of start-ups in the sector.
- Public and private investment funds specializing in quantum computing.
- What can we learn from early failures in the field?
- Likely trends for the coming years: hardware, software and services.
- Quantum computing for modelling: complex modelling tackles intractable problems.
- The challenges that quantum computing can solve: climate change, transport, augmented intelligence.
- Teleportation, superposition: these principles call into question certain human certainties?

4 Draw up a roadmap: monitoring, training, prototypes

- How to define your roadmap: this is a marathon, not a sprint.
- Set up a technological and strategic watch: deduce an industrial strategy.
- First training initiatives.
- Who to train and who to recruit in the coming years.
- Define PoBs (Proofs of Business), which will lead to PoCs (Proofs of Concept), the first prototypes.
- The energy, societal and ethical impacts of quantum computing.
- Why it's difficult to anticipate rules for a field whose contours we don't yet know.
- How quantum computing may help us to understand the world better.
- How to connect to the first concrete applications and participate in research: climate, transport, AI.

Dates and locations

REMOTE CLASS
2026 : 31 Mar., 26 May, 8 Sep., 17 Dec.