# in association with **DREW & NAPIER**

## Quantum Computing Concepts for Cybersecurity

#### **Course Objectives**

Quantum mechanics has revolutionised the way how to think about the world; its characteristics still perplex the brightest minds, even among physicists. Yet brilliant minds like Richard Feynman, who seemingly said "If you think you understand quantum mechanics, then you don't' thought of new ways to harness whatever they understood; he saw e.g., that quantum-based computers will be needed to perform calculations that would be impractical or impossible using classical computers. Quantum computing, though still at small scale, has since become reality and is poised to revolutionises many areas involving computations. Despite the enormous progress made in classical hardware and software, and even though classical computing will remain dominant in many areas, quantum computing is constantly improving and will in due course affect security and privacy (both on the internet and offline); maintaining 'reasonable' security will then not be as trivial as a quick update or upgrade. Larger entities already work on this, while smaller ones are now well advised to appreciate what will hit them and how to prepare, especially as guidance from regulators is still rather sparse in this area. This course focuses on explaining (and de-mystifying) basic concepts of quantum computing in the context of the vast risks for privacy and cybersecurity; it also addresses areas where quantum computing can improve privacy and cybersecurity. The course explains the typical physics jargon and technical details in an understandable way for non-Information Technology (IT) audience and decision makers.

This course complements our <u>Cybersecurity Primer</u> which focusses on traditional cybersecurity.

#### Who should attend?

- Privacy / Software / Security / Artificial Intelligence (AI) Engineers, Technical Staff, Developers, Data Analysts, Data Architects, and IT Project / Risk Managers
- Data Protection Officers (DPOs), Compliance Professionals, Corporate / In-house Counsels, IT Managers, Chief Information Officers (CIOs), and Chief Information Security Officers (CISOs)

#### Course Details

Course Code:	CS103
Title:	Quantum Computing Concepts for Cybersecurity
Duration:	1/2 day (approximately 3.5 contact hours)
Mode of Training: In-person	
Venue:	Drew & Napier LLC
	10 Collyer Quay, 10th Floor, Ocean Financial Centre
	Singapore 049315
Course Fee:	S\$300.00 (excluding GST)

To view available dates and register for this course, please click <u>here</u>. You may view all available courses and our course schedule(s) on our Academy webpage (<u>https://www.drewnapier.com/Academy</u>).



### DREWACADEMY DATA PROTECTION & CYBERSECURITY SERVICES

#### **Course Outline**

- 'Traditional' security and privacy and the respective 'quantum' risks
- Basic concepts:
  - o Quantum information theory / science, quantum physics / mechanics and quantum computing
  - Spin and Polarization
  - o Wave and / or particle Interference
  - o Bit versus Qubit as 'state' or information
- The 'quantum' advantage
  - $\circ$  Superposition
  - o Entanglement
  - o Teleportation
  - No-cloning and no-communication
  - Phase (global, local) and Interference (constructive, destructive)

#### • Probabilistic vs deterministic: computation vs measurement / observation

- Peek into 'quantum' algorithms
- o 'Real' random numbers
- Search and optimisation
- o Breaking current cryptography
- 'Post-quantum'
  - Encryption schemes
  - Secure key-exchange

#### **Course Facilitator**



**Albert Pichlmaier** is Senior Learning Technology Designer with Drew Academy and concurrently Senior Cybersecurity & Privacy Engineer with Drew & Napier's Data Protection, Privacy & Cybersecurity practice. He holds a degree in Computer Science from a German tertiary institution. He is a Certified Information Systems Security Professional (CISSP), a Certified Data Privacy Solutions Engineer (CDPSE), a holder of the Singapore WSQ Advanced Certificate in Learning and Performance (ACLP), and a certified Blockchain Developer. Albert is credited as an inventor of two patents granted in Germany and other countries. His technical expertise covers a wide-ranging area of matters involving Cybersecurity, Privacy Engineering, Cryptography, Quantum Computing, Artificial Intelligence / Machine Learning, Blockchain Development, Data Analytics, Big Data, and Data Visualisation. For the courses and webinars

under the Drew Academy, he draws from this pool of knowledge and experience to explain technical content to nontechnical audiences, develop proof-of-concept and learning tools, and engage with experts on finer details.

Albert was formerly an Executive Manager with the Personal Data Protection Commission (PDPC), where he was involved in technology assessments for data breach investigations, research into trending / disruptive technologies and advising on technical aspects of various PDPC guidelines and publications (amongst other matters). Prior to his role with the PDPC, Albert worked in technology-related organisations in the private and public sector in Germany, Spain, and Singapore. He was also a technopreneur, having set up a company to provide testing tools for embedded systems and smartcard applications.