



## GLOBAL SUMMER PROGRAMME 2025

### IS465S Quantum Computing in Financial Services

Instructor Name : Paul Griffin  
 Title : Assoc Prof  
 Email : Paul GRIFFIN  
 Office : Rm 5037



#### COURSE DESCRIPTION

Quantum computing is now being realised at an ever-increasing pace. “Quantum advantage” has been demonstrated and the underlying technology continues to advance rapidly. While everyone talks about the speed of quantum computers, the power of this technology is not just in how fast calculations can be performed but also the size of data that can be processed. The overall objective of the course is to understand quantum computing, how it differs from classical computing and what the main applications are, now and in the future. Emphasis is placed on FinTech/Banking applications, e.g., risk, investments. Furthermore, you can experience interacting with real quantum computers and explore the quantum world.

#### LEARNING OBJECTIVES

Upon completion of the course, students will be able to:

- Explain the fundamentals of quantum computers
- Recognize the advantages and disadvantages of quantum computers in financial services
- Use real quantum computers
- Predict advancements in quantum computing
- Recommend quantum computers for the correct problem types

#### PRE-REQUISITES / REQUIREMENTS / MUTUALLY EXCLUSIVE COURSE(S)

None.

#### ASSESSMENT METHODS

Quizzes  
 Group Assignment

#### INSTRUCTIONAL METHODS AND EXPECTATIONS

- Lectures on the main topics
- Discussion and quizzes
- Demonstration of key elements and the use of quantum simulators
- Hands-on labs with simulators and real quantum computers

## CONSULTATIONS

Ad-hoc as required

## RECOMMENDED TEXT AND READINGS

- Book – Johnston, Eric R.. Programming Quantum Computers . O'Reilly Media. Kindle Edition.
- Qiskit tutorials - <https://quantum-computing.ibm.com/docs/>
- Blogs:
  - o <https://www.quantamagazine.org/tag/quantum-computing/>
  - o <https://www.scottaaronson.com/blog/>
  - o <http://www.quantumforquants.org/blog/>
  - o <https://cloudblogs.microsoft.com/quantum/>

Google quantum supremacy paper -

[https://authors.library.caltech.edu/99516/2/41586\\_2019\\_1666\\_MOESM1\\_ESM.pdf](https://authors.library.caltech.edu/99516/2/41586_2019_1666_MOESM1_ESM.pdf)

## UNIVERSITY POLICIES

### **Academic Integrity**

All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences.

All work (whether oral or written) submitted for purposes of assessment must be the student's own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offense.

When in doubt, students should consult the instructors of the course. Details on the SMU Code of Academic Integrity may be accessed at <https://smu.sharepoint.com/sites/oasis/SitePages/DOS-WKLSWC/UCSC.aspx>.

### **Copyright Notice**

Please note that all course materials are meant for personal use only, namely, for the purposes of teaching, studying and research. You are strictly not permitted to make copies of or print additional copies or distribute such copies of the course materials or any parts thereof, for commercial gain or exchange.

For the full copyright notice, please visit <https://researchguides.smu.edu.sg/copyright>.

### **Accessibility**

SMU strives to make learning experiences accessible for all. If you anticipate or experience physical or academic barriers due to disability, please let me know immediately. You are also welcome to contact the university's accessibility services team if you have questions or concerns about academic provisions: [accessibility@smu.edu.sg](mailto:accessibility@smu.edu.sg). Please be aware that the accessible tables in our seminar room should remain available for students who require them.

LESSON PLAN		
LESSONS	TOPICS	REMARKS
LESSON 1	<i>Introduction to quantum computing</i>	
LESSON 2	<i>Use cases for quantum computing</i>	
LESSON 3	<i>Quantum phenomena</i>	Using IBM Composer
LESSON 4	<i>Qubits, gates and circuits</i>	Guest speaker
LESSON 5	<i>Quantum algorithms I (QML)</i>	Using Classiq
LESSON 6	<i>Quantum algorithms II (Optimisation)</i>	Using IBM Composer
LESSON 7	<i>Quantum algorithms III (Modelling)</i>	Using Classiq
LESSON 8	<i>Site visit to Centre of Quantum Technologies</i>	
LESSON 9	<i>Quantum hardware</i>	Guest speaker
LESSON 10	<i>Future of quantum computing</i>	
LESSON 11	<i>Assignment presentations</i>	
LESSON 12	<i>Review</i>	Quiz 2