



Gifted Education Fund: Off-school Advanced Learning Programme (2024/25 school year)

# Quantum Talent accelerator: From Classical to Quantum Communication Network (funded by Gifted Education Fund)

Organiser : HKUST Department of Physics

Implementation period: late May 2025 to December 2025

Target participants: S1 – S5 HKAGE student members in 2024/25 school year

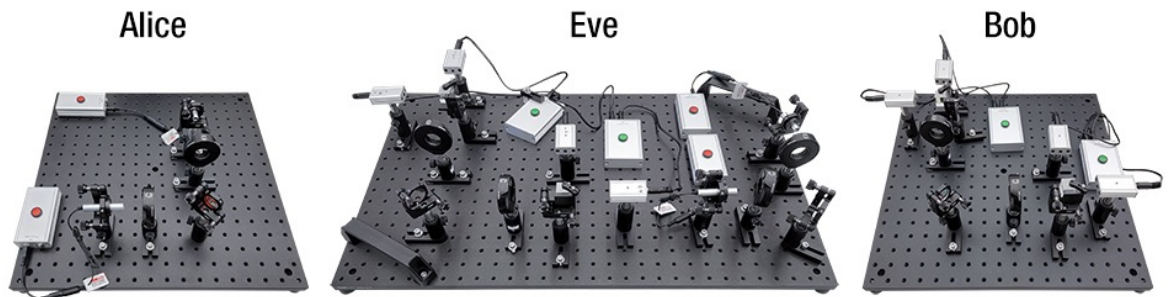
Medium of instruction:

Course material: **English**

Class teaching/ discussion: English supplemented with Cantonese

*Join us on an exciting journey from classical to quantum communication.  
Equip yourself with skills that will shape the future of technology!*

Students will have the opportunity to learn about and simulate the renowned quantum key distribution (QKD) protocol, BB84 using the optical setup.



Students will explore the fundamental concept of quantum entanglement and its applications in quantum communication and quantum satellite.

### Programme information:

[HKUST Department of Physics]

Dr. Choy Ting Pong

Tel no.: 3469 2265

Email: tingchoy@ust.hk

The Hong Kong Academy for Gifted Education

Tel no.: 3940-0101

Email: programme@hkage.org.hk

Application deadline:

2<sup>nd</sup> April 2025 (12:00 noon)

Application result announcement date:

23 Apr 2025

Application:

<https://www.hkage.edu.hk/en-us/articles/osalp>



**Quantum leaps**  
China's Micius satellite, launched in August 2016, has now validated across a record 1200 kilometers the "spooky action" that Albert Einstein abhorred (1). The team is planning other quantum tricks (2-4).

Light-altering crystal creates entangled photon pairs

Micius (500 km altitude)

1. Spooky action  
Entangled photons were sent to separate stations. Measuring one photon's quantum state instantly determines the other's, no matter how far away.

2. Quantum key distribution  
Micius will send strings of entangled photons to the stations, creating a key for eavesdrop-proof communications.

3. Quantum teleportation  
Micius will send one entangled photon to Earth while keeping its mate on board. When a third photon with an unknown state is entangled with the one on Earth, and their states jointly measured, the properties of the last photon are instantly teleported up to Micius.

4 Global network  
Future satellites and ground stations could enable a quantum internet.

India, All observatory, Dellingha ground station, Eilang ground station, China, Indian ocean

**Credit: doi: 10.1126/science.aan6972**

## Programme schedule (3 hours for each session, venue at HKUST)

Session	Date	Content
<b>Phase 1: Introduction to quantum physics</b>		
1	17 May PM	Physics of light and photons
2	24 May PM	Physics of matter waves
3	7 June PM	Quantum Superposition
4	14 June PM	Quantum Entanglement and Bell's inequality
5	21 June PM	Uncertainty Principle
<b>Phase 2: Application of quantum physics in computation and communication</b>		
6	5 July PM	Quantum State and Qubit -1
7	12 July PM	Quantum State and Qubit -2
8	19 July PM	Introduction to the Quantum Circuit Model - 1
9	26 July AM	Introduction to the Quantum Circuit Model - 2
10	26 July PM	Quantum Cryptography and Key Distribution – 1
11	2 Aug AM	Quantum Cryptography and Key Distribution – 2
12	2 Aug PM	Physics of Laser, Optical Fiber and Photonic Technologies - 1
13	9 Aug AM	Physics of Laser, Optical Fiber and Photonic Technologies - 2
14	9 Aug PM	Long-Distance Quantum Networks, Quantum Repeaters, and Quantum Satellites – 1
15	16 Aug AM	Introduction to Quantum algorithm and quantum programming
16	16 Aug PM	RSA Encryption and Shor's Algorithm
17	23 Aug AM	Introduce the Grover's search quantum algorithm
18	23 Aug PM	Introduction to Quantum Teleportation
19	30 Aug PM	Introduction to Quantum Information
<b>Phase 3: Group project and final showcase</b>		
20-29	6 Sep to 8 Nov AM or PM	Group project and weekly discussion
30	15 Nov PM	Project discussion and rehearsal - 1
31	22 Nov PM	Project discussion and rehearsal - 2
32	29 Nov PM	Final Showcase

### Application:

Log in using the link below and complete the selection questions to apply.



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(12:00 noon)

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## Our past Off-school Advanced Learning Programme (2022/23 school year) Quantum Computing for Gifted Students 2022-07 (funded by Gifted Education Fund)

無綫新聞 2024年03月01日 (五) 13°C 濕度 71%

推薦 快訊 港澳 兩岸 國際 財經 體育 法庭 天氣 專題節目 新聞追蹤 昔日

無綫新聞 > 港澳 > 資優教育學苑與科大合辦量子計算課程 助高中生了解量子電腦應用等

資優教育學苑與科大合辦量子計算課程 助高中生了解量子電腦應用等

發佈日期: 2024-02-15 10:00 | 港澳



比傳統電腦快近一億倍



資優教育學苑與科大合辦量子計算課程 助高中生了解量子電腦應用等

[https://news.tvb.com/tc/local/65cd705536b98b72b0b94f6f?utm\\_source=newswebshare&utm\\_medium=referral](https://news.tvb.com/tc/local/65cd705536b98b72b0b94f6f?utm_source=newswebshare&utm_medium=referral)

香港資優教育學苑與香港科技大學合辦資優學生量子計算課程，讓高中學生了解量子電腦操作原理、算法及應用。

這四名中五及中六學生圍著的這部是量子電腦模擬器，它的計算速度比傳統電腦快近一億倍。他們經學校老師推薦，利用課餘時間，修畢由資優教育學苑及科大合辦、為期七個月的量子計算課程，包括量子計算理論、量子算法編程等。

共40名學生這日「畢業」，分享他們的畢業作品。

如此高深的新興科技，有否難倒這班資優生？香港資優教育學苑學生胡耀梓說：「這個量子電腦，它是可以在同一時間內，做到很多不同的計算。其實我都覺得科技真是發展得很快，可以好好地利用科技，去幫助我們日常生活的不同事物。」

香港資優教育學苑學生何睿寧稱：「量子計算這東西聽起來，好像是一些很高科技，或者很前沿的科技，但是沒想到我報讀完這個課程，是可以這麼近距離地接觸到這樣看起來真的很厲害的東西。」

學員會學習用這台量子電腦，它能夠同時處理多件事，加快計算速度。

### 大學推進階課程助資優生發展興趣 中五生簡報量子計算：沒想到能接觸厲害東西

有線新聞 · 2024年02月15日

分享



[https://www.i-cable.com/新聞資訊/198827/大學推進階課程助資優生發展興趣-中五生簡報量子計算?utm\\_source=icable-web&utm\\_medium=referral](https://www.i-cable.com/新聞資訊/198827/大學推進階課程助資優生發展興趣-中五生簡報量子計算?utm_source=icable-web&utm_medium=referral)



量子計算在不同領域的應用

【有線新聞】施政報告提出要進一步培育本地科技、工程、藝術及數學人才，有大學推出進階學習課程，協助資優學生在常規課堂外發展他們的興趣。

這一批在台上簡報的中學生，題目都是關於量子計算在不同領域的應用，台下「聽課」都是大學教授。這群都是資優生，正在常規中學課程外參與大學舉辦的進階學習班，鑽研量子計算和量子信息處理科學。

中五學生何睿寧：「量子計算這樣東西聽起來像很高科技或者很前沿的科技，但沒想到我報讀完這個課程後可以那麼近距離接觸這麼厲害的東西。」中六學生吳沛熹：「雖然物理都可以，但是我更加偏向電腦科學那方向，那他（老師）就說有一個（課程）原來將這兩個範疇連繫，我覺得很有趣就參加了。」