CADT
IDT វិទ្យាស្ថានបច្ចេកវិទ្យាឌីជីថល
Institute of Digital Technology

Quantum Computing

From Theory to Practical

Gen 10 SE Y4 2026-2027

Lecturer: **Ms. HENG Sovanmonynuth**

Software Engineering (SE), Faculty of Digital Engendering, Department of Computer Science

Cambodia Academy of Digital Technology (CADT)

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About Me

Ms. HENG Sovanmonynuth

Educations

- **Master of Engineering - in Artificial Intelligence Convergence** (Quantum Computing), Pukyong National University, Busan, South Korea
- **Bachelor of Science – in Computer Science**, Department of Computer Studies, College of Science, Norton University
- **Bachelor of Education – in Teaching English as a Foreign Language (TEFL)**, Faculty of Education, Arts, and Humanities, BELTEI International University

Professional Works

- **Innovation Program Coordinator**, Department of Computer Science, IDT, CADT
- **Lecturer/Researcher**, Cambodia Academy of Digital Technology (CADT)
- **Product Manager**, QB Technology Solution

Pre-Assessment Test

This is the Pre-Assessment Test: https://forms.gle/46R1U1hWTkYEe1ux8

Course Information

- Lecturer: **Ms. HENG Sovanmonynuth**
- Course Title: **Quantum Computing**: From Theory to Practical
- Main Textbook: **Michael A. Nielsen & Isaac L. Chuang — *Quantum Computation and Quantum Information*** (Cambridge University Press, 10th Anniversary Edition, 2010).
- Number of Chapters: 11 Chapters to 8 Sessions
- Academic Year: **29.09.2026 – 04.12.2026** (10 Weeks + 2 Weeks)
- Credit: 2 Credits (30 Hours)
- Lecturing Hours: **Monday & Thursday**
- Office Hours: Tuesday 09:00AM – 12:00PM
- Telephone: (+855) 95 479 274
- Email: sovanmonynuth.heng@cadt.edu.kh

Course Description

This course introduces students to the **principles and applications of quantum computing**. Learners will study fundamental **quantum mechanics concepts**, **quantum gates**, **circuits**, and **algorithms**, while practicing hands-on experimentation using **Quantum Circuit Simulators**.

- Quantum Education Solutions
- Quantum Finance
- Quantum Chemistry/Biomedicine
- Quantum Games
- Quantum Logistic/Routing System
- Quantum Cryptography/Cybersecurity
- Quantum AI/Machine Learning
- Quantum Information Science

Course Learning Objectives (CLOs)

By the end of the course, learners should gain the following ***knowledge***:

- **CLO1:** Describe the **fundamental principles of quantum mechanics** underlying quantum computation.
- **CLO2:** Explain how linear algebra and **quantum formalism** are used to represent qubits, gates, and circuits.
- **CLO3:** Identify key **quantum algorithms** (e.g., Deutsch–Jozsa, Grover, Shor) and their computational significance.
- **CLO4:** Recognize the **relationship between quantum computing and emerging domains** such as quantum field theory.

Course Learning Objectives (CLOs)

By the end of the course, learners should gain the following ***skills***:

- **CLO5**: Apply quantum circuit design principles using **open quantum simulator**.
- **CLO6:** Demonstrate the implementation and simulation of **basic quantum algorithms** on quantum simulators.
- **CLO7:** Analyze and evaluate the **performance of quantum circuits** for specific applications in computing and optimization.
- **CLO8:** Collaborate effectively to **design and develop a final project** that integrates quantum computing concepts into creative applications.

Course Learning Objectives (CLOs)

By the end of the course, learners should gain the following ***attitudes***:

- **CLO9:** Appreciate the importance of **ethical responsibility and integrity in advancing quantum technologies**.
- **CLO10:** Demonstrate **curiosity**, **adaptability**, and **perseverance** when exploring complex and emerging quantum concepts.
- **CLO11:** Value **teamwork** and **interdisciplinary** collaboration in **solving problems** with quantum computing.

Course Learning Level

Course Learning Outcomes (CLOs)		Bloom Taxonomy					
KS	**CLOs**	**Remember**	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Create**
Knowledge	CLO1	✓	✓				
	CLO2		✓	✓			
	CLO3	✓	✓				
	CLO4		✓		✓		
Skills	CLO5			✓			
	CLO6			✓		✓	
	CLO7				✓	✓	
	CLO8					✓	✓
Attitude	**CLOs**	**Receiving Phenomena**	**Responds to Phenomena**	**Valuing**	**Organization**	**Internalize Values**	
Attitude	CLO9		✓			✓	
	CLO10		✓	✓			
	CLO11		✓			✓	

Course Outline

For every 1 contact hour (RL + P + BL combined), students should expect 1–2 hours of SDL.

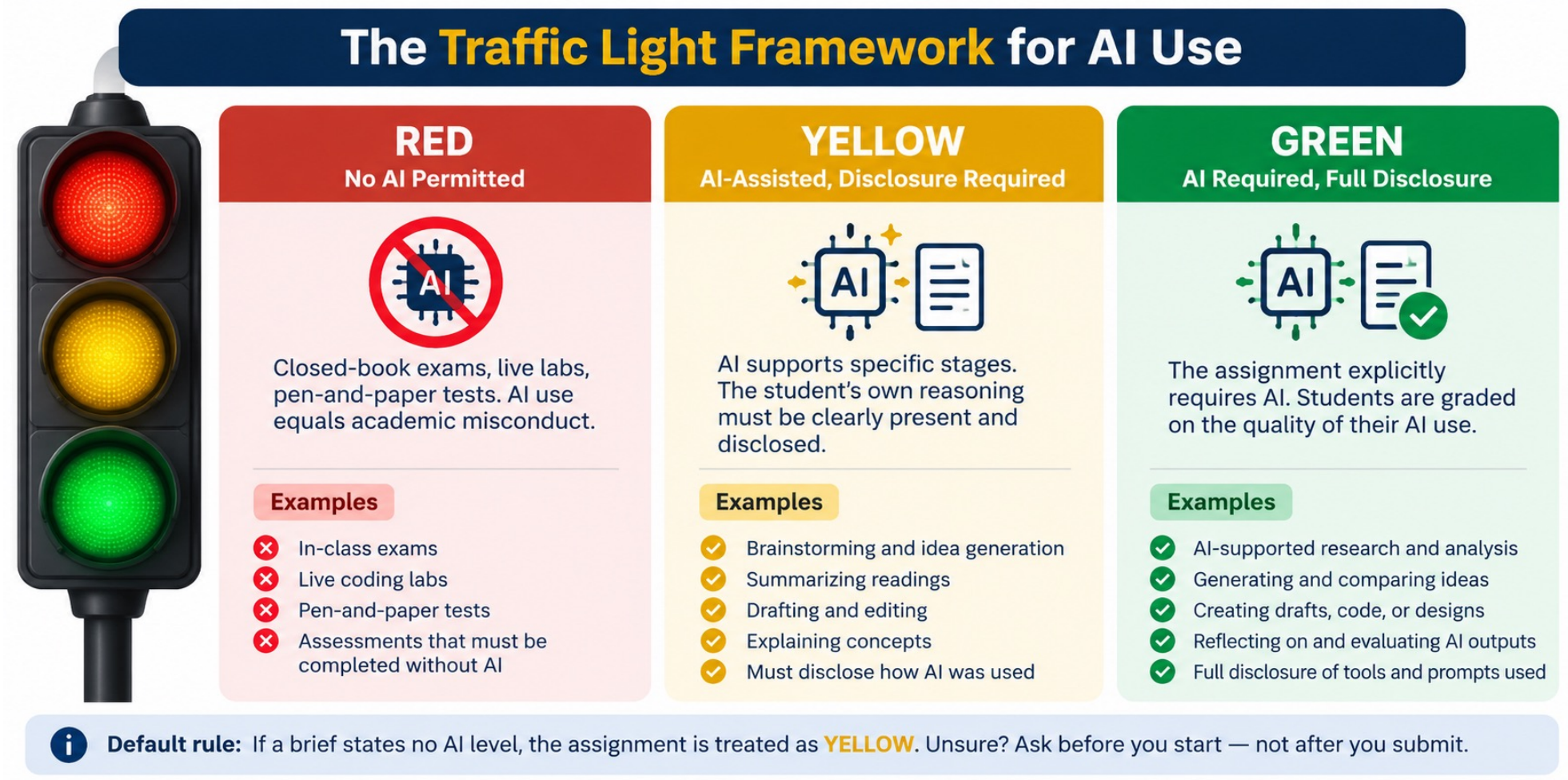
Session	***Topic***	***Contact Hours***				***Required Reading***	***Assignments***
		RL	**P**	**BL**	**SDL**		
1	Introduction to Quantum Computing	1	1	1	3	TBP	TBP
2	The Basic of Quantum Mechanics	1	1	1	3	TBP	TBP
3	Quantum Algorithms	1	1	1	3	TBP	TBP
4	Quantum Fourier Transform	1	1	1	3	TBP	TBP
5	Quantum Errors & Noises	1	1	1	3	TBP	TBP
6	Quantum Machine Learning	1	1	1	4	TBP	TBP
7	Quantum Chemistry	1	1	1	4	TBP	TBP
8	Quantum Cryptography	1	1	1	4	TBP	TBP

Course Assessment

This is a practical course; the **assessment** will be based on your project work.

1. Attendance : 10%
2. Class Participation: 10%
3. Weekly Assignment: 15%
4. Capstone Project: 25%
5. Final Exam: 40%

AI Ethic and Use Guildlines



Course Schedule

📝 Course Schedule for Gen 10_SE

Total Weeks: 10 Weeks

Class Time: 2 Session (3 hours: 1.5 hours-Lecture & 1.5 hours-Practical Lab)

October									November									December
1-Oct	5-Oct	8-Oct	12-Oct	15-Oct	19-Oct	22-Oct	26-Oct	29-Oct	2-Nov	5-Nov	9-Nov	12-Nov	16-Nov	19-Nov	23-Nov	26-Nov	30-Nov	3-Dec	7-Dec

Note:

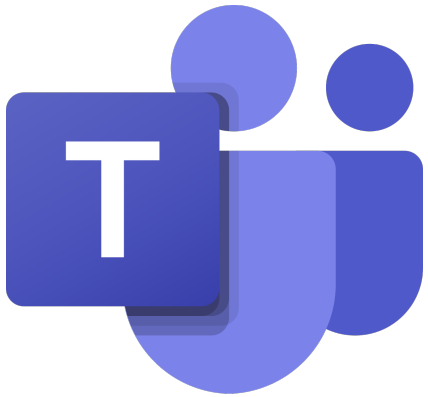
- 12 Oct: Pchum Ben Festival
- 15 Oct: King Father's Commemoration Day
- 29 Oct: King Coronation Day
- 9 Nov: Independence Day
- 23 Nov: Water Festival
- 19-30 Nov: Seminar
- 3 Dec: AI for Education National Conference

Course Communication

Telegram group: daily communication

Microsoft Teams Class: class material, assignment, & final project







Next Actions

What to do

- Form a team of 2-5
- Prepare for a Presentation
- Send team info in Telegram Group

E.g. **Group 1: Quantum Machine learning**

1. Kak Kannika
2. Khov Somawatey
3. Cheng Socheat
4. Chao Sunly
5. Kheng Chamnan


Thank you!