PHYS 5001
Physics of Quantum Information
Fall 2024

Objectives
To understand both the theoretical and practical aspects of quantum computing. We will learn some essential topics such as classical information theory, the fundamental principles of quantum bits, and the mathematical underpinnings provided by linear algebra. We focus on quantum programming, to implement algorithms that harness the unique capabilities of quantum entanglement and superposition to solve problems far beyond the reach of classical computers. This course also includes hands-on programming exercises, and critical analysis of quantum algorithms.

Meeting Time: Mon, Wed & Fri (1.00 – 1.50 pm)
Place: Physics 127

Instructor
Yew San Hor
Email: yhor@mst.edu
Office: SJH 111
Office Hour: By Appointment.

Textbooks
1. Introduction to Classical and Quantum Computing by Thomas G. Wong
2. Quantum Computation and Quantum Information by M. A. Nielsen and I. L. Chuang

Topics
The Physics of Quantum Computers and Information. Classical Information and Computation. Quantum Physics. Quantum Bit. Linear Algebra. Quantum Programming. Quantum Entanglement. Quantum Algorithms. Quantum Noise. Quantum Error-Correction. Quantum Cryptography. Building Quantum Computer.

Grading
1. Homework (50 %)
   Problems will be given as homework. Late homework will cause 10 % reduction. No late homework will be accepted one week after a given due date.
2. Written Exams (50 %)
   There will be a mid-term exam (20 %) and a final exam (30 %).

Grading Scale
>89.5 % = A
>79.5 % = B
>69.5 % = C
>59.5 % = D