

# CERTIFICATE

## Yevhenii Fastovets

Has successfully completed test requirements of  
The European Information Technologies Certification Programme

### EITC/QI/QIF Quantum Information Fundamentals

**Certification Programme examination result:**



60%

**Certification Programme description:**

Introduction to Quantum Mechanics: introduction to double slit experiment, double slit experiment with waves and bullets, conclusions from the double slit experiment; Introduction to Quantum Information: qubits, geometric representation, photon polarization, uncertainty principle; Quantum Entanglement: k-level system and bra-ket notation, systems of two qubits, entanglement, EPR paradox, Bell and EPR, rotational invariance of Bell state, CHSH inequality, Bell and local realism; Quantum Information processing: time evolution of a quantum system, unitary transforms, single qubit gates, two qubit gates; Quantum Information properties: no-cloning theorem, Bell state circuit, quantum teleportation, quantum teleportation using CNOT, quantum measurement; Introduction to Quantum Computation: n-qubit systems, universal family of gates, reversible computation, conclusions from reversible computation; Quantum Algorithms: Fourier sampling, applying Fourier sampling, Simon's algorithm, conclusions from Simon's Algorithm; Simon's algorithm in terms of the double slit experiment, extended Church-Turing thesis; Quantum Fourier Transform: QFT overview, n-th roots of unity, discrete Fourier Transform, n-th dimensional Quantum Fourier Transform, properties of Quantum Fourier Transform; Shor's Quantum Factoring Algorithm: period finding, Shor's factoring algorithm, QFT circuit; Grover's Quantum Search Algorithm: needle in a haystack, Grover's algorithm, implementing Grover's Algorithm; Observables and Schrodinger's equation: introduction to observables, observables properties, Schrodinger's equation; Introduction to implementing qubits: continuous quantum states, Schrodinger's equation for a 1D free particle, particle in a box, implementing qubits; Introduction to Quantum Complexity Theory: limits of quantum computers, adiabatic quantum computation, BQP; Introduction to spin: spin as a qubit, Bloch sphere, Stern-Gerlach experiment, Pauli spin matrices; Manipulating spin: Larmor precession, spin resonance, classical control

**Certificate Programme version/revision:** EITC/QI/QIFv2r1

**Earned ECTS credits:** 2



**CERTIFICATE ID:** EITC/QI/QIF/FXR24004437

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