KARTA PRZEDMIOTU / COURSE DESCRIPTION

Nazwa przedmiotu w języku polskim / Course name in Polish			
Informacyjne technologie kwantowe			
Nazwa przedmiotu w języku angielskim / Course name in English			
Information quantum technologies			
Dyscyplina / Scientific discipline			
Informatyka techniczna i telekomunikacja			
Opis skrócony / Short description			
Quantum information technologies are not taught in a compact form as a whole creating a new area of engineering and technical sciences, including in particular the scientific discipline s of AEE and ITT. This area is interdisciplinary and includes the following knowledge with the adjective quantum: a principle of operation, technology of functional elements and devices, photonics, computer science, computer architecture, atomic scales, sensors and measuring devices, complex quantum systems, programming methods, etc. With the current rapid development of the area IKT, the subject on this subject seems almost obligatory. Lecture content: the area of quantum information technologies, information theory of qubit, quantum commuting, quantum cryptography, physical qubit realization, magnetic and optical qubits, stationary and moving qubits, quantum computer theory, quantum computer engineering, quantum photonic computer, quantum cloud environments, quantum sensors, quantum imaging, atomic clocks, quantum telecommunications, ARTIQ-SINARA design environment.			
Opis / Description			
Quantum information, the unit of which is a qubit, is contained in a quantized, discrete state of a quantum system. What distinguishes it from classical information is its probabilistic character and the possibility of coding it in non-local relationships between quantum systems. Quantum non-local relationships, which are a universal property of the universe, are called entangled states. A quantum system is an object subject to quantum mechanics and is limited in size to the atomic scale. A qubit is an arbitrary superposition of two quantum states marked as | 0> and | 1>. When you read the value of a qubit, you get a value of 0 or 1 with some probability. You cannot predict which value will be read. The state of the quantum system is unstable, limited by the time of decoherence. This time, determined by noise and the properties of the reading system, limits the scalability of quantum technologies. The qubit is an electron and its bivalent spin, a photon and its bivalent polarization state, an ion with two suitably selected energy levels, but also molecules with spin, quantum oscillators or quasiparticles. A quantum register is an ordered system of qubits. Logical quantum gates are built from qubits and their systems. Quantum systems are built from qubits, quantum gates and control and control systems: computers, clocks, sensors, measuring systems, devices, gravimeters, accelerometers, and many others. To control qubits, you need advanced photonics, ultra-stable tunable single-frequency lasers, and advanced, preferably standardized electronics.			
Język / Language			
Angielski/ English			
ECTS	2	**Prowadzący/ Lecturer**	prof. dr hab. inż. Ryszard Romaniuk
Forma zaliczenia / Examination		Egzamin/ Exam	
Wykład / Lecture		30	