Mathematical methods of quantum information
Cele kształcenia
The aim of this lecture is to provide students with mathematical knowledge to understand basic concepts of quantum information theory as well as formulate and solve problems within this theory.
Treści programowe
The course contents includes presentation of the following concepts (lecture and exercises will be devoted to the same topics): 1. Basic concepts of linear algebra: linear space, linear operator, matrix calculus 2. Basic concepts of functional analysis: Banach spaces and Hilbert spaces, bounded and unbounded operators, various types of norms, selfadjoint operators, spectral theorem, functional calculus, positive definite operators 3. POVMs and quantum measurement 4. Tensor products of Banach spaces and Hilbert spaces, operators on tensor products, Schmidt decomposition, Schmidt rank and Schmidt number, mathematical definition of entanglement, PPT states 5. Fock space, CCR and CAR relations 6. Positive and completely positive maps on matrix algebras: k-positivity, decomposability, entanglement witnesses 7. Quantum channels, capacity of quantum channels, problem of additivity 8. Tensor products of positive maps and distillation of entanglement, bound entanglement
Wykaz literatury
• O. Bratteli, D Robinson, Operator algebras and statistical mechanics, vol. I • E. Stormer, Positive maps on operator algebras • M. Hayashi, Quantum information theory. Mathematical foundation • B.C. Hall, Quantum theory for mathematicians • Material provided by the lecturer.