<table>
<tr><td colspan="2">Code:
MscTI_AQC</td><td colspan="2">Course Title:
Applied Quantum Computing</td></tr>
<tr><td colspan="2">Module Coordinator:
JProf. Dr. Marko Rančić</td><td colspan="2">Type:
Lecture with exercises</td></tr>
<tr><td>Credit points:
?</td><td>Workload:
180h</td><td>Teaching Hours:
4 / week</td><td>Term:
ST</td></tr>
<tr><td colspan="4">Module Parts and Teaching Methods:
• Lecture (3-2 h / week)
• Practical exercises with homework (1-2 h / week)</td></tr>
<tr><td colspan="4">Objectives:
By the end of this lecture, the students will be able to:
• Understand the benefits which quantum computing brings to classical computing
• Understand the main bottlenecks of modern quantum computing
• Name most common approaches to quantum computing
• Get extensive hands on experience and theoretical understanding of main quantum computing algorithms</td></tr>
<tr><td colspan="4">Content:
• Introduction to quantum mechanics
• Introduction to quantum computing
• Quantum noise
• Quantum computing approaches: Universal Quantum computing, NISQ Quantum computing and Quantum Annealing,
• Main architectures: Superconducting, Photonic, Trapped Ions, Spin qubits

Universal quantum computing algorithms:
• Shor’s algorithm
• Grover’s algorithm
• HHL algorithm
• Quantum phase estimation

Noisy-intermediate scale algorithms:
• Variational Quantum Eigensolver (VQE)
• Imaginary time evolution (ITE)
• Quantum Approximate Optimization algorithm (QAOA)

• Quantum annealing</td></tr>
<tr><td colspan="2">Prerequisites:
none</td><td colspan="2">Recommended Knowledge:
Basic Computer Architecture</td></tr>
<tr><td colspan="4">Literature:
• Lecture Notes and Handouts
• A list of sources that will be provided in the course</td></tr>
<tr><td colspan="4">Testing: Defined by the lecturer before the beginning of the course</td></tr>
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