

L37. Room: B220**KEA Datamatiker valgfag**

**Fall 2020**

**Introduction to Quantum Computing**

**Semester Plan**

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| Week in year | Lecture | **Topic** | **Syllabus** | **Activities** |
| **35**  Aug 27 | 1 | * Overview - Double slit experiment * Basic math | QCE 1 Check the exercises | Collaborative learning at Umesh Vazirani (L1.1-3)  QCE 11-15  QCE 58,68  QCE 28-30,39 +  Obligatorisk aflevering 1 |
| **36**  Sep 3 | 2 |  | RECAP/Reptition Question/Answers  We will concentrate on Qiskit Installations  QCE 2 (11-29) Check the exercises  Decide and begin to create Your report of own choice | Collaborative learning at Umesh Vazirani (L2.1-4)  Obligatorisk aflevering 2 |
| **37**  Sep 10 | 3 | * Systems of 2 Qubits * Polarization * Heisenbergs uncertainty principle QCE P68 | * + QCE 2-3   + Check the exercises | Collaborative learning at Umesh Vazirani (L3.1-4)  Obligatorisk aflevering 3 |
| **38**  Sep 17 | 4 | * Bell * Entanglement QCE-7 * CHSH | * + QCE 3-4-7   + Check the exercises | Collaborative learning at Umesh Vazirani (L4.1-4)  Obligatorisk aflevering 4 |

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| **39**  Sep 24 | 5 | * CHSH 1 | QCE 4-5  Check the exercises | Obligatorisk aflevering 5 |
| **40**  Oct 1 | 6 | * CHSH 2 | QCE 5-6  Check the exercises  Deliver Mandatory report 1   * Topic of own choice | Obligatorisk aflevering 6 |
| **41**  Oct 8 | 7 | * Quantum Gates | QCE 8  Check the exercises | Collaborative learning at Umesh Vazirani (L5.1-4)  Obligatorisk aflevering 7 |
| **42**  Oct 15 | 8 | * Quantum Teleportation | QCE 10  Check the exercises | Collaborative learning at Umesh Vazirani (L6.1-5)  Obligatorisk aflevering 8 |
| **43**  Oct 22 | 9 | * Quantum Cirquits | QCE8  Check the exercises | Collaborative learning at Umesh Vazirani (L7.1-4)  Obligatorisk aflevering 9 |
| **44**  Oct 29 | 10 | DTU Exercise  Ulrich Busk Hoff  Senior Adviser  Operational leader of QuantumDTU  Technical University of Denmark  DTU Physics  Fysikvej  Building 307, Room 258  2800 Kgs. Lyngby | Lidt om omgivelserne på DTU  <http://www.quantum.dtu.dk/education/quantumlab> | <https://www.fysik.dtu.dk/-/media/Institutter/Fysik/Undervisning/Nanoteket/Vejledninger/QuantumLabBellsUlighed.ashx?la=da&hash=A9DC7FAC2652CFB20E50295F798B93FD96D9526B> |

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| **45**  Nov 5 | 11 | * Early Quantum Algorithms | QCE 9  Check the exercises | Collaborative learning at Umesh Vazirani (L8.1-6)  Obligatorisk aflevering 11 Her skal du aflevere kort rapport om de måledate du/I har arbejdet med på dagen – Fotokopier af papir materiale er helt OK |  |  |
| **46**  Nov 12 | **12** | * Quantum Fourier transformations | QCE 9  Check the exercises | Collaborative learning at Umesh Vazirani (L9.1-5)  Obligatorisk aflevering 12 |  |  |
| **47**  Nov 19 | 13 | * Quantum Factoring | QCE 9  Check the exercises | Collaborative learning at Umesh Vazirani (L10.1-3)  Obligatorisk aflevering 13 |  |  |
| **48**  Nov 26 | 14 | * Quantum Search | QCE 9  Check the exercises | Collaborative learning at Umesh Vazirani (L11.1-3)  Obligatorisk aflevering 14 |  |  |
| **49**  Dec 3 | 15 | * Quantum Cryptography | QCE 11  Check the exercises | Obligatorisk aflevering 15 |  |  |
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NB! Tilpasninger vil forekomme gennem semesteret

Literature ranked in order of importance

Need to have – Obligatorisk bog som jeg anbefaler at I køber men i vil også kunne finde den på fronter som PDF

1. David McMahon “*Quantum Computing Explained”[QCE]* ISBN: 978-0-470-09699-4

Nice to have som pdf nedenfor

1. Michael A. Nielsen & Isaac L. Chuang “*Quantum Computing and Quantum Information”[QCQI]*  ISBN: 978-1-10700-217-3