

# Symmetry and Quantum Information (Spring 2018)<sup>†</sup>

Mon 9-11 (SP G2.02) & Tue 9-11 (SP G0.18B)

**Course Homepage:** <https://staff.fnwi.uva.nl/m.walter/qit18/>

**Lecturer:** Michael Walter ([m.walter@uva.nl](mailto:m.walter@uva.nl))

Office: L237, CWI

## Tentative Schedule:

Lecture	Topic
1	Welcome & syllabus. Introduction to quantum mechanics, uncertainty principle.
2	Super-dense coding, teleportation, generalized measurements.
3	Quantum correlations and non-local games.
4	Pure state estimation, symmetric subspace.
5	Introduction to representation theory, Schur's lemma.
6	Irreducibility of symmetric subspace.
7	Representation theory of SU(2), density operators.
8	Entanglement of pure and mixed states, monogamy of entanglement.
9	Classical and quantum data compression.
10	Construction of typical subspace, compression and entanglement.
11	Spectrum estimation, i.i.d. quantum information.
12	Universal typical subspaces, Schur-Weyl duality.
13	Fidelity, quantum state tomography.
14	Analysis of tomography measurement, swap test, quantum Schur transform.
15	Circuit for the Clebsch-Gordan transform, quantum entropy, mutual information.
16	Quantum state merging, decoupling theorem. Q&A.

The schedule may get adjusted depending on your background and interests. The last day of class is Tuesday, March 27 and the exam is on Thursday, April 5.

**Grading:** Your grade will be determined by your successful and timely completion of the *problem sets* (40%) and a written *final examination* (60%). There will be one problem set per week, posted on the course homepage by Monday, and you should submit your completed assignment before the Tuesday lecture the week after (either in class or by email).

**Literature:** Lecture notes will be offered on a weekly basis and include pointers to supplementary reading material. For background literature on quantum information theory and representation theory, see the course homepage.

**Honor Code:** Collaboration is welcome and encouraged, but you must write up your solutions yourself. Please see the regulations at <https://student.uva.nl/en/content/az/plagiarism-and-fraud/plagiarism-and-fraud.html>.

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<sup>†</sup>Last updated on March 26, 2018.