

PHY 690K : QUANTUM DYNAMICS, INFORMATION AND COMPUTATION

The focus of this special topics course will be towards building an overall understanding of many of the recent developments in the field of quantum information and computation, from the quantum dynamics perspective. There will be a scope to delve deeper into the theoretical underpinnings as well as get realistic understanding of the various experimental set-ups. Undoubtedly *quantum-tech* being what's on the horizon, the understanding of the fascinating physics underlying it, becomes indispensable.

Outline

The course is roughly broken down into the following two parts :

- Qubits and cryptography : quantum state tomography, single and multiple qubit systems, quantum state transformations, von Neumann entropy, complexity.
- Entanglement and algorithms : quantum subsystems and properties of entangled states, entanglement as a resource, eigenstate thermalization, area laws of entanglement, quantum error correction, topological order.

References

- [1] Quantum Computing, a gentle introduction, by E. Rieffel and W. Polak.
[2] Lecture notes by John McGreevy, UCSD, <https://mcgreevy.physics.ucsd.edu/f19/2019-239-lectures.pdf>.

Instructors

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Prerequisites

Completed either one of PSO 201A / PHY 313A / PHY 431A. In case requirements are not met, please get in touch with the instructors.