

Course outline, Cornell Physics 7661 Fall 2021

I. Quantum field theory (~ 2 weeks)

- (1) QFT in vacuum
- (2) QFT at finite temperature
- (3) QFT in curved spacetime
- (4) Conformal field theory

II. Black hole thermodynamics (~ 5 weeks)

- (5) The laws of black hole thermodynamics
- (6) Path integrals in quantum gravity
- (7) Hawking radiation
- (8) The AdS/CFT correspondence
- (9) Eternal black holes in anti-de Sitter

III. Black holes and quantum information (~ 7 weeks)

- (10) Quantum entropy and entanglement
- (11) Holographic entanglement entropy
- (12) Generalized entropy
- (13) Hawking's information paradox
- (14) Replica wormholes and entanglement islands
- (15) More paradoxes
- (16) Scrambling and quantum chaos