

[Physics 238C]
Entanglement and Tensor Networks

SYLLABUS

Spring 2016
Professor Steven White

Lecture: Tuesday 11:00-12:20 and 1:30-2:50 RH 142

Instructor: Steven White, srwhite@uci.edu
Office: 310L Rowland Hall, phone 4-2256
Office Hours: Drop by

Additional Lecturers: Miles Stoudenmire, Glen Evenbly

Final: Individual Projects

Web Site: <https://eee.uci.edu/16s/48480>, Course 48480. Check this site for announcements, homework assignments, solutions, and other information. I will also email.

Reading Material:

U. Schollwock, *Numerical methods in the study of non-equilibrium strongly interacting quantum many-body physics*; (Les Houches Lectures; see class home page)

Jacob C. Bridgeman, Christopher T. Chubb, *Hand-waving and Interpretive Dance: An Introductory Course on Tensor Networks*, arXiv:1603.03039

U. Schollwock, *The density-matrix renormalization group in the age of Matrix Product States*, arXiv:1008.3477

Bei Zeng, Xie Chen, Duan-Lu Zhou, Xiao-Gang Wen, *Quantum Information Meets Quantum Matter -- From Quantum Entanglement to Topological Phase in Many-Body Systems*, arXiv:1508.02595

Julia Computer Language, julialang.org

ITensor: itensor.org

Topics:

Spin systems, Julia computer language

Exact diagonalization; Lanczos method

Introduction to entanglement; area laws

Matrix product states

ITensor C++ library

Time evolution

Matrix product operators

Infinite system methods

Fermionic systems

Finite temperature

Projected Entangled Pair states (PEPS)

Multiscale Entanglement Renormalization Ansatz (MERA)

Tensor network renormalization

Wavelets and analytic MERAs