

Phys 578C Autumn 2023

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Statistical Field Theory and Topological Effects in Quantum Field Theory

Course Content:

Statistical Field Theory: In the first part of the course, we will develop some quantum field theoretic concepts and topics in the context of lattice statistical field theory. These include: the Ising model, Landau-Ginzburg theory, real space renormalization group, epsilon expansion, Wilson-Fisher fixed points, and 1+1d non-linear sigma models.

The references for this part are: 1) John Cardy, *Scaling and Renormalization in Statistical Physics* and 2) David Tong, *Lectures on Statistical Field Theory*.

Topology in Quantum Field Theory: This is a huge area and we will only cover a few examples. These will include 1+1d Luttinger liquids and the Kosterlitz-Thouless transition, bosonization, path integrals, Wess-Zumino-Witten term in the spin path integral. We will adjust as needed.

Course Expectations:

There will be homework, which will be worth 100% of the grade. The homework assignments will be weekly, short, and designed to ensure that you are able to follow the lectures.