Field Theory in the Solid State, Fakher Assaad

The class will take place virtually on Tuesdays from 12:15-14:00 and on Thursdays from 8:15-10:00. We will start on Tuesday 13th of April.

Below you will find the zoom link:

https://uni-wuerzburg.zoom.us/j/92964811405?pwd=cTY0RmxyK0pzbTlsNHRoUFh6TDZsQT09

Meeting ID: 929 6481 1405

Password: 336273

The class will deal with path integral formulations in the solid state. Path integrals is the method of choice to tackle a number of problems within a single theoretical framework. After an introduction I will cover the following topics

Chapter 1: Fermions

1. Coherent state path integrals for fermions: The Grassmann Algebra
2. Wicks theorem and perturbation theory.
3. Effective zero dimensional model for the single impurity Anderson model
4. Dirac systems and Chern Simons field theories of topological insulators
5. Topological terms

Chapter 2: Bosons

1. Coherent state path integral
2. The X-Y model
3. Spin waves and topological excitations
4. The Kosterlitz Thouless transition
5. Renormalization group

Literature:

1. Negele-Orland: Quantum Many Body systems
2. E. Fradkin: Filed theories of condensed matter physics
3. C. Mudry: Lecture notes on field theory in condensed matter physics

4. A. Bernevig: Topological insulators and topological superconductors
5. X.G. Wen: Quantum field theory of many-body systems