mini-Projects

presentations

- summarize key physics points in reading.
- 15 min presentation
  - 5-10 slides: demonstrating an intro. for basic theory / method, and the key results
  - numerical demonstration: in the form of a problem set (of course you need to solve it!)
- numerical codes

topics

You can form your own topic. Here are some suggestions (and guiding questions)

- coherent states
  - susy qm (first 2 chapters)
  - notes from Nicholas Wheeler
  - Qs:
    - understand how the ladder operator works
    - what are the key features of a coherent state?
- constituent quark model
  - quark model
  - Qs:
    - how to understand the spectrum of charmonium states in the PDG: n, J, L, ?
    - attempt to fit the low lying states.
    - explore the effect of spin-orbit couplings.
- resonances
  - resonances
  - kinematics
  - Qs:
    - understand the Breit-Wigner parametrization, fit this to the rho(770) state or Delta(1232) state.
    - derive the 2- and 3-body decay formula for structureless decay.
    - how to understand a Dalitz plot?
- Van der Waals parametrization of phase diagram
  - any Stat. Mech. Textbook, e.g. Kerson Huang and Pathria
  - molecules

  - Qs:
    * how attractive and repulsive forces affect the shape of phase diagram ?
    * how Maxwell construction works?
    * relate the Van der Waals parameters to those of a microscopic model, e.g. Walecka model.

- Ising model beyond nearest-neighbor forces
  - Kogut
  - intro. notes
  - Qs:
    * study the order parameter and the susceptibility
    * how the phase transition is modified by higher pairing forces
    * hysterysis and how it evolves with temperature
    * other objects: vortices, etc.