mini-Projects

presentations

- summarize key physics points in reading.
- 20 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

Choose one topic from below or form your own! Here are some suggestions (and guiding questions)

- Animating EM waves from time-varying charge distribution.
  - Compute the time-dependent E and B fields from a charge distribution. Draw the field lines.
  - Accelerates the charge distribution and show simulate how EM waves are formed.
  - Why sky is blue and the ω^4 dependence.
  - Dispersive medium, linear response and all that.
- Understanding resonances.
  - resonances
  - kinematics
  - how (intermediate) resonances show up in a Dalitz plot.
  - how dynamics are affecting the distributions.
  - coupled-channel models.
- Path Integral for dissipative system.
  - Rosenfelder
  - Chow & Buice
  - study the damped oscillator problem.
  - dissipative Quantum System.
  - extracting the density of states.
  - moment generating functionals.
- Simulation of non-abelian gauge theory.
  - study the SU(2) or SU(3) gauge groups (or beyond!)
  - write numerical code to extract observables.
  - study the Polyakov loop (and its susceptibility)
  - effective model description

  - ref1

- Modeling of the QCD phase diagram.
  - NJL model VS the bag model.
  - Confinement of quarks VS Confinement of gluons.
  - Cluster / virial expansion: a symbolic computation.
  - 3rd and 4th virial coefficients in a potential model.
  - phase space models for dense matter.