Course requirements

- Submit Project1 report on time
- Submit Project2 report on time
- Oral exam:
  - Presenting Project1 and Project2
  - Answer questions on other topics from the course book
- Don’t be upset if the first report did not get maximum scores.
- The comments try to help you to make better one next time. Also in the 2nd report.
- THERE is a possibility to improve the reports, correct the mistakes notified in the assessment report
- DO NOT copy form others/internet!!!
- UPLOAD YOUR CODE! if not already done so

Topics for Project2

Range of topics

- NUMERICAL EXPERIMENT -> REPORT + code/notebook (not just the code!)
- Anything related to chapters 15-20 of the course book (Rubin Landau: Survey of Computational Physics, 2008 edition)
- You should read ahead of lecture topics
- Check out the “Assessment” section at the end of chapters for ideas
- Check out my notes in the annotated book
- Check out the ideas listed on the course webpage
- Search the web for ideas
- You may repeat some (simple) numerical experiment from research papers
- Your own (related) ideas are welcome, too! If you are not sure, if it is appropriate, ask!
- Select something interesting, but doable!
- Check out the formal requirements!

Topics

- Statistical physics simulations
  - Metropolis Monte Carlo simulations of various systems
  - Ising model and variants phase transition, antiferromagnet
  - Ising model on different grids, different topologies, e.g. Ising on fractal
  - Spin glass, Hopfield model
  - Compare advanced sampling methods to simple Monte Carlo
  - Path integral for various (simple) systems
- Molecular dynamics
  - Van-der-Waals gas simulation, measure thermodynamic quantities
  - Demonstrate phase transition temperature in argon gas
  - Vary potential parameters, effect of periodic boundary conditions
  - Study initial transients (not easy to set correct correlated initial positions and velocity)
  - Compare simulations with different integrators

Topics

- Elliptic PDEs
  - Electric potential of various geometries
  - Heat flow with various geometries
  - Compare Fourier vs lattice methods
  - Finite element vs finite difference methods
- Wave equations
  - Normal modes of membranes, Chladni patterns
  - Schrödinger equation, bounded wave packets
  - “Realistic” strings or other simple musical instruments
- Fluid dynamics
- Integral equations

Examples

- Heat diffusion
- Ising 2D
- Membrane
- Navier-Stokes

- KEEP THE DEADLINES! For both plan and project submissions!
- Contact kooplex@complex.edu in case of **technical** problem
- Write to szamszimmsc@gmail.com if **class related** problem
- Read the info on class page!