Physics 562: Graduate Statistical Mechanics

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Statistical Mechanics explains how simple behavior emerges out of complex, fluctuating interactions of many microscopic degrees of freedom.

Simplicity emerges when you look at the big picture.

- Historical origins in the theory of gases and heat engines
  - Complex molecular collisions
    - Thermodynamics
- Matured in equilibrium theory of phases: solids, liquids, superconductors, superfluids, metals, semiconductors, etc.
Homework (~1/3 grade): Every other week
  Due Mondays
  Alternates w/ Quantum II
  homeworks
  Collaboration encouraged

Midterm Takehome:  March 1 - March 10
  No class Mar 4, 6, 8
  ~1/4 grade
  Open book, no collaboration

Final: Takehome:  ~1/2 grade

First homework due NEXT MONDAY
  - Wordy
  - Long
  - Start tonight (1/1)
• Challenged by transition between phases
  Glorious Triumph: Renormalization Group
  Cornell’s Central Role: Widom, Fisher, Wilson

• Current Frontiers
  • Chaotic Systems
    Onset of Chaos
    Spatiotemporal Chaos
  • Disordered Systems
    Percolation, Localization
    Spin Glasses, Neural Networks
  • Complex Systems
    Small World
    Highly Optimized Tolerance
  • Crackling Noise
    Earthquakes, Magnetic Barkhausen Noise
    Ecological extinctions (? Asteroid ?)
  • Large Fluctuations
    Stock Markets
    Floods