

## **683: Basic Training in Condensed-Matter Theory**

Veit Elser, Piet Brouwer, Christopher L. Henley, James P. Sethna

WF 2:30-4:00, 119 Baker Lab

website: <http://people.ccmr.cornell.edu/~veit/teaching/phys683/home.html>

Current and potential LASSP theorists expected to take all modules. Experimentalists and outside theorists welcome to take individual modules for credit – but contact us before the beginning of the semester. Current plans are to have weekly problem sets, exams and/or papers after each unit.

Dates and topics are subject to change. Approximate timetable and topics:

### **Introductory Meeting, Wednesday January 25**

#### **Random Matrix Theory: *Brouwer*, January 27 – February 8**

- Symmetries and Ensembles
- Correlation Functions and Coulomb Gas Analogy
- Applications to Mesoscopic Physics and other fields

#### **Quantum Hall Effect: *Henley*, February 10 – March 10**

- Integer quantized Hall effect: localization, percolation pictures
- Fractional QHE: Laughlin's wavefunction
- Feynman-Bijl single mode approximation for excitations
- Quasiparticles with fractional charge/statistics
- Composite fermions and edge excitations

#### **From Glasses to Computational Complexity: *Sethna*, March 29 – April 7**

- Glasses: Broken Ergodicity, Low Temperatures, Glass Transition
- Spin Glasses: Frustration, Clusters, Replicas, and Cavities
- Neural Networks: Storage Capacity and the Glass Transition
- NP Completeness and Glass Transitions: Survey Propagation Algorithm

#### **Asymptotic Analysis: *Elser*, April 12 – May 5**

- An Assortment of Integrals and Techniques to find their Behaviors
- Singular Points of Ordinary Differential Equations
- Singular Perturbations
- Asymptotic Matching