Course outline for lectures by S. Das

Field Theory and Statistical Mechanics :

Critical Phenomena and the Renormalization Group.
Epsilon Expansion,
O(N) linear and non-linear sigma models
2d sigma models and Ricci flows

2) **Conformal Invariance** :
Conformal group
Conformal Field Theory in two dimensions
Scale and Conformal invariance

3) **AdS/CFT Methods**
Large N matrix field theories and gravity
The AdS/CFT correspondence : correlation functions
Finite temperature and chemical potential - hydrodynamics
Holographic Superconductors
Quantum Quench

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The first part is of course standard and can be found in a standard field theory book.

An accessible account of part (2) is contained in the article by Cardy in *Domb, L. (Ed.), Lebowitz, J.l. (Ed.): Phase Transitions and Critical Phenonema, Vol. 11*, 55-126. For higher dimensions, a good reference is in fact chapter 2 of Aharony et.al. hep-th/9905111. This chapter can be read without any reference to string theory etc.

For AdS/CFT with a cond-mat perspective good references are
Hartnoll 0903.3246 and McGreevy 0909.0518