

**School of Mathematics**

**Course 446 — Topics in Theoretical Physics (Statistical Mechanics)** 2004-05  
(SS Theoretical Physics  
SS Mathematics )

**Lecturer:** Professor T. Dorlas

**Requirements/prerequisites:** 441, some knowledge of metric spaces and norms

**Duration:** 21 weeks

**Number of lectures per week:** 3 hours per week, likely to be in one block and held at the Dublin Institute for Advanced Studies, 10 Burlington Road

**Assessment:**

**End-of-year Examination:** End of year exam, 3 hours, may be held earlier than usual exams.

**Description:**

This is a new course (not the same topics as in 2002-3), and will be offered also to UCD students. That may place restrictions on the timing of the exam.

Course on Quantum Spin Systems

1. Refresher of thermodynamics with emphasis on convexity.
2. Hamiltonians for quantum lattice systems and existence of dynamics.
3. Thermodynamic limit of the free energy.
4. Entropy, the variational principle and tangent planes.
5. The KMS condition and the relative Hamiltonian.
6. Mean-field theory.
7. Absence of phase transitions in 1 dimension.
8. The Peierls argument.
9. Reflection positivity.

October 6, 2004