

School of Mathematics

Module MA3443 — Statistical physics I
(JS Theoretical Physics)

2010-11

Lecturer: Dr. Stefan Sint

Requirements/prerequisites:

Duration: Michaelmas term, 11 weeks

Number of lectures per week: 3 lectures including tutorials per week

Assessment:

ECTS credits: 5

End-of-year Examination: This module will be examined jointly with MA3444 in a 3-hour examination in Trinity term, except that those taking just one of the two modules will have a 2 hour examination. However there will be separate results for MA3443 and MA3444.

Description:

Learning Outcomes: On successful completion of this module, students will be able to:

- work with the formalism of equilibrium thermodynamics;
- describe the characteristics of a phase transition of first order;
- demonstrate a basic understanding of how macroscopic equilibrium properties arise from the underlying microscopic physics, as defined by classical mechanics;
- show familiarity with the notion of ensembles and apply an information theoretical argument to find the most likely ensemble compatible with given micro and macro constraints;
- demonstrate understanding that the choice of ensemble becomes irrelevant in the thermodynamic limit as a consequence of the central limit theorem;
- derive the equation of state for a non-interacting system of N mass points;
- include interactions systematically by means of the high temperature and virial expansions;
- derive the van der-Waals equation of state by applying a mean field argument;
- apply the methods of statistical physics to simple model systems.