

Doi Lectures on Soft Matter Physics

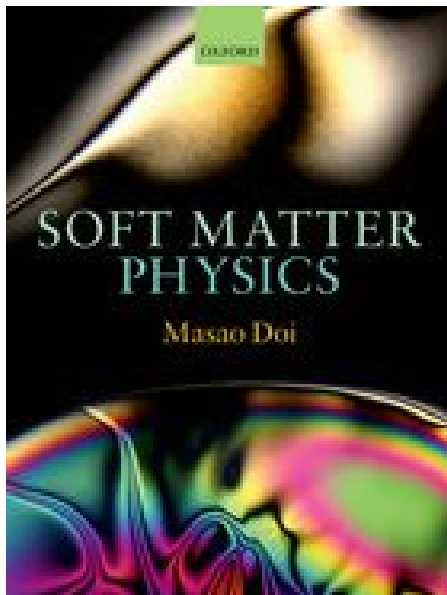


This unique course on the principles of soft matter physics will be given in the DTU spring semester 2014 by Otto Mønsted visiting professor, Masao Doi. The lectures will be based on his recent textbook "Soft Matter Physics", Oxford University Press (2013).

Soft matter includes various materials, polymers, colloids, surfactants etc. They are not like usual liquids nor usual solids: it is something in between. Though complex their behaviors are, they can be understood in terms of physics. The purpose of this lecture series is to discuss such general principles (the principles in thermodynamics and irreversible thermodynamics) which are useful in understanding the complex behavior of soft matter.

Points: 5 ECTS

Registration: The lectures are open to M.Sc. students, Ph.D. students and other interested persons. Registration and sign up by mail to oh@kt.dtu.dk with copy to kell@nbi.ku.dk.





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Preliminary lecture plan 2014:

05/02 Introduction: Solution theory for incompressible liquids, thermodynamic quantities, phase separation.

12/02 Soft matter solutions: Lattice model for solutions, polymer solutions, colloidal solutions.

19/02 Rubber and Gels: Description of elasticity, Hyper elasticity, Elasticity of a polymer chain.

26/02 Rubbers and Gels: NeoHookian model, Balloon blowing.

05/03 Rubbers and Gels: Free energy of gels, Swelling and squeezing, Squeezing.

12/03 Brownian motion: Time correlation function, Langevin equation and Smoluchowskii equation.

19/03 Onsager principle: hydrodynamic reciprocal relation, reciprocal relation in non-equilibrium thermodynamics

26/03 Diffusion and sedimentation: collective diffusion, sedimentation.

02/04 Gel dynamics: Osmotic stress, filtration, squeezing.

09/04 Drying: Kinetics of drying, drying of a gel.

16/04 Rheology: viscoelasticity, plasticity, constitutive equations.

23/04 Rheology: Molecular theory

30/04 Contact line dynamics: Contact line motion, challenges.

Textbook: Soft Matter Physics, M. Doi, Oxford University Press (2013)

