

<b>PHYS 566 Special Topics in Condensed Matter Physics</b> <b>B. Hetényi</b> <b>2013 Spring Syllabus</b>		
<b>Week</b>	<b>Main subtitles</b>	<b>Additional information</b>
1	Classical models in two dimensions	Duality for square lattice, duality for the triangular and honeycomb lattices, star-triangle relations, transfer matrices for the square lattice, properties of transfer matrices: commutation, inversion, symmetries
2	Classical models in two dimensions/Ice Type models	Eigenvalues of the transfer matrices for the square lattice, solution, critical behaviour; Behte ansatz for ice models
3	No class	Will schedule makeup class
4	Coordinate Bethe ansatz	Spin-1/2 Heisenberg model, Lieb-Liniger gas, finite system, thermodynamics limit, excited states, finite temperature Bethe ansatz
5	One-dimensional quantum systems/Bosonization	General remarks, representation of excitations of a spinless model, correlation functions, charge and spin excitations
6	Luttinger liquids/DMRG	Phenomenological bosonization, links with 2D statistical mechanics, numerical approach to low-D systems: DMRG
7	Transport in quantum models	Modern theory of polarization, modern theory of conductivity

### Literature:

- R. J. Baxter, *Exactly Solved Models in Statistical Mechanics*, (Academic Press, 1982).
- V.E. Korepin, N.M. Bogoliubov, and A.G. Izergin, *Quantum Inverse Scattering Method and Correlation Functions* (Cambridge Monographs on Mathematical Physics, 1997).
- T. Giamarchi, *Quantum Physics in One Dimension*, (Oxford Science, 2004).
- B. Sutherland, *Beautiful Models: 70 Years of Exactly Solved Quantum Many-Body Problems* (World Scientific, 2004).
- D. C. Mattis *The Many-Body Problem: An Encyclopedia of Exactly Solved Models in One Dimension* (World Scientific, 1993).
- Scanned copy of lecture notes will be made available.

### Course requirements and evaluation:

**Homeworks and quizzes, participation (attendance and active participation).**

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