Statistical Mechanics

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SSD	FIS02	Course Credit	9	Year (I, II)	I	Semester (I , II)	II

CONTENTS

Laws of Thermodynamics. Entropy. Thermodynamic Potentials. Legendre Transformations.
Random Walks. The Postulates of Statistical Mechanics. Liouville Theorem. Ergodic Hypothesis.
Microcanonical Ensemble. Ideal Gas. Gibbs Paradox.
Canonical Ensemble. Partition Function. Energy Fluctuations. Thermodynamic Limit. Harmonic Oscillators. Paramagnetism. Negative Temperature. Energy Equipartition Theorem.
Grand Canonical Ensemble.
Percolation. Critical Phenomena. Critical Exponents. Ising Model and Lattice Gas Model. Broken Symmetry. Mean Field Theories. One-Dimensional Ising Model. Correlation Function. Relations between Critical Exponents. Scaling Laws and Universality. Real Space Renormalization Group. Ising Model in Two Dimensions.
Quantum Statistical Mechanics. Density Matrix.
Nonequilibrium Statistical Mechanics. Fluctuation-Dissipation Relation. Master Equation. Fokker-Planck Equation. H-Theorem. Spectral Analysis

BIBLIOGRAPHY

A. Coniglio: “Elementary Course in Statistical Mechanics” (cap. 1-10, 11 §1-3), in rete: http://people.na.infn.it/~peruggi/cs-all4.pdf
F. Peruggi: “Percolation”, disponibile in rete all’indirizzo: http://people.na.infn.it/~peruggi/Percolation.pdf
K. Huang: “Meccanica Statistica” Zanichelli.
R. K. Pathria: “Statistical Mechanics” Butterworth-Heinemann.