

Module description

Module title					Abbreviation
Statistical Physics 11-T-S-152-m01					
Module coordinator				Module offered by	
Managing Director of the Institute of Theoretical Physics Faculty of Physics and Astronomy and Astrophysics					
ECTS Method of grading		Only after succ. compl. of module(s)			
8 numerical grade					
Duration		Module level	Other prerequisites		
1 semester		undergraduate			
Contents					
 Statistical Physics: Entropy and probability theory; entropy in classical physics; thermodynamic equilibrium in closed and open systems (with energy and / or particle exchange); Ideal systems: Spin systems; linear oscillators; ideal gas; Statistical Physics and thermodynamics: The 1st law; quasi-static processes; entropy and temperature; generalised forces; the second and third law; reversibility; transition from Statistical Physics to thermodynamics; Thermodynamics: Thermodynamic fundamentals relationship; thermodynamic potentials; changes of state; thermodynamic machines (Carnot engine and efficiency); chemical potential; Ideal Systems II, quantum statistics: Systems of identical particles; ideal Fermi gas; ideal Bose gas and Bose-Einstein condensation; grids and normal modes: Phonons; Systems of interacting particles: Approximation methods (mean-field theory, Sommerfeld expansion); computer simulation (Monte Carlo method); interacting phonons (Debye approximation); Ising models (particularities in 1 and 2 dimensions); Yang-Lee-theorems; Van der Waals equation for real interacting gases; Critical phenomena: Scaling laws, critical slowing down, fast variable as Bad (electron-phonon interaction and BCS superconductivity); magnetism (quantum criticality at low temperatures, quantum phase transitions at T = 0; problems of the thermodynamic limit 					
The students have advanced knowledge of the methods of Theoretical Physics. They know the principles of stati- stical mechanics and thermodynamics. They are familiar with the corresponding mathematical methods and are able to independently apply them to the description and solution of problems in this area.					
Courses (type, number of weekly contact hours, language — if other than German)					
V (4) + Ü (2) Module taught in: Ü: German or English					
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)					
written examination (approx. 120 minutes) Language of assessment: German and/or English					
Allocation of places					
Additional information					
Workload					
240 h					
Teaching cycle					
Referred to in LPO I (examination regulations for teaching-degree programmes)					



Module appears in

Bachelor' degree (1 major) Mathematics (2015) Bachelor' degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor' degree (1 major) Mathematics (2023) exchange program Physics (2023)

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