

(Table 5.2) Course unit description

Study program: Physics				
Type and level of studies: master studies				
Course unit: Quantum statistical physics				
Teacher in charge: Momir Arsenijevic, assistant professor				
Language of instruction: English				
ECTS: 7				
Prerequisites: Basic knowledge of theoretical physics courses: quantum mechanics, classical statistical physics, classical electrodynamics				
Semester: summer semester				
Course unit objective Learning about macroscopic quantum phenomena, quantum magnetism, critical phenomena through methods of the second quantization, Green's functions and the renormalization group. Some time will be spent on phenomenological side of respective phenomena.				
Learning outcomes of Course unit Students will get insight into sophisticated methods of theoretical physics, methods which are nowadays seen as multifacet tools for further working in theoretical physics, as well as in applications e.g. quantum technologies				
Course unit contents Representation of second quantization. Superfluidity. Superconductivity, BCS model. Quantum magnetism, Heisenberg model, spin waves. Critical phenomena of quantum systems. Methods of the Green's functions and the renormalization group.				
Literature				
<ol style="list-style-type: none"> 1. Franz Schwabl, <i>Advanced quantum mechanics</i>, Springer, 2008 2. Michael Sadovsikii, <i>Statistical Physics</i>, Boston: De Gruyter, Berlin, 2012 3. Tony Guenault, <i>Basic superfluids</i>, CRC Press, 2002 4. Gordon Fraser, Ed., <i>The New Physics for the twenty-first century</i>, Cambridge University Press, Cambridge, UK, 2006 				
Number of active teaching hours				Other classes:
Lectures: 28	Practice:	Other forms of classes: mentoring system for small groups of students	Independent work: 28	
Teaching methods				
Examination methods (maximum 100 points)				
Exam prerequisites	No. of points	Final exam	No. of points	
Practical classes		Written examination	50	
Tests		Oral examination		
Homework	50	Other		
Seminars				
Project				

Grading system		
Grade	No. of points	Description
10	≥ 91	Excellent
9	81-90	Exceptionally good
8	71-80	Very good
7	61-70	Good
6	51-60	Passing
5	≤ 50	Failing