AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Quantum Statistical Mechanics								
Course Code	FZK601		Couse Level	Third Cycle (Doctorate Degree)					
ECTS Credit	7	Workload	176 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	The aim of this lecture is to explain basic concepts of quantum statistical mechanics, density matrix, and quantum partition function, ideal Bose and Fermi gases; Bose-Einstein condensation.								
Course Content	Quantum statistical mechanics and degenerate matter, ideal gas of quantum particles, Bose-gas and BE condensation, Ising model, general theory of equilibrium including phase transitions and critical phenomena, interacting particles, including non-ideal gases and ferromagnetism.								
Work Placement									
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Discussion, Individual Study, Problem Solving								
Name of Lecturer(s)									

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	20
Final Examination	1	30
Quiz	2	8
Attending Lectures	14	28
Assignment	14	14

Recommended or Required Reading	
1	Thermodynamics and Statistical Mechanics - W. Greiner, L. Neise, H. Stöcker
2	Statical Mechanics - R. K. Pathria
3	Statical Mechanics - Kersan Huang

Week	Weekly Detailed Course Contents	
1	Theoretical	Quantum statistical mechanics
2	Theoretical	General properties of the partition function
3	Theoretical	Approximation methods
4	Theoretical	Variational principles
5	Theoretical	Fermi systems
6	Theoretical	Landau diamagnetism
7	Theoretical	Pauli paramagnetism
8	Intermediate Exam	Midterm Exam
9	Theoretical	Bose systems
10	Theoretical	The Bose-Einstein condensate
11	Theoretical	The Ising model
12	Theoretical	Spontaneous magnetization
13	Theoretical	Onsager solution
14	Theoretical	The Landau approach
15	Theoretical	Superconductivity
16	Final Exam	Final Exam

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	3	3	84
Assignment	12	2	3	60
Quiz	4	1	1	8
Midterm Examination	1	7	5	12

Final Examination	1	7	5	12
			Total Workload (Hours)	176
			[Total Workload (Hours) / 25*] = **ECTS**	7
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	After completion of the course student should be familiar with the relation between the phenomenological thermodynamics and the microscopic description in statistical physics.
2	To be able to independently treat problems in thermodynamics and statistical physics.
3	To be able to develop, applications in physics and other natural sciences based on thermodynamic and statistical physical principles.
4	To describe, use and develop mean field theory for first and second order phase transitions.
5	To be able to discuss the various classical ensembles and quantum ensembles
6	To be able to solve the statistical mechanics problems using ensemble theory
7	To be able to explain the connection between classical statistical mechanics and quantum statistical mechanics
8	To be able to explain the concept of density matrix

Programme Outcomes *(Physics Doctorate)*	
1	
2	
3	
4	
5	
6	
7	
8	

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5	L6	L7	L8
P1	5	4	5	4	4	5	4	5
P2	4	4	4	5	5	4	4	4
P3	4	3	5	4	5	4	3	3
P4	3	5	4	4	3	3	4	4
P5	4	4	3	4	3	5	5	5
P6	2	3	4	3	4	4	4	4
P7	3	5	4	3	4	4	5	3
P8	4	4	3	3	2	3	3	4