AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Introduction to Many Body Physics								
Course Code	FZK606		Couse Level		Third Cycle (Doctorate Degree)				
ECTS Credit	7	Workload	175 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To investigate many body systems, introduce student to the main techniques and concepts, to give student first-hand experience in calculations and problem solving using these methods.								
Course Content	Second Quantization, Phonons and photons, Fermi and Bose fluids, Green's Functions and Feynman diagrams. Finite temperature Green Functions. Application of Finite temperature Feynman Diagrams to electron-phonon problem								
Work Placement	N/A								
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	Introduction to Many Body Physics, P. Coleman London 2012
2	Many Particle Physics, G. Mahan, NewYork 2000
3	Methods of Quantum Field Theory in Statistical Physics, Abrikosov, Gorkov and Dzyalozinskii 1975

Week	Weekly Detailed Course Contents	
2	Theoretical	Scales and Complexity
3	Theoretical	Collective Quantum Fields
4	Theoretical	Harmonic Oscillator: a zero dimensional field theory
5	Theoretical	Conserved Particles
6	Theoretical	The vacuum and many body Schrödinger Equations
7	Theoretical	Simple examples of second quantization
8	Intermediate Exam	Midterm exam
9	Theoretical	The Hubbard Model
10	Theoretical	Green’s Functions
11	Theoretical	Landau Fermi Liquid Theory
12	Theoretical	Zero Temperature Feynman Diagrams
13	Theoretical	The Self Energy of electron
14	Theoretical	Finite Temperature Many body Physics
15	Final Exam	Final Exam

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	3	3	84
Assignment	12	3	2	60
Quiz	4	3	1	16
Midterm Examination	1	5	1	6

Final Examination	1	7	2	9
			Total Workload (Hours)	175
			[Total Workload (Hours) / 25*] = **ECTS**	7
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	To be able to apply many body physics methods to selected physical systems
2	To be able to apply many-body methods
3	To be able to solve many body problems using Feynmann Diagram
4	To be able to determine the ground state of harmonic oscillator by using uppering and lowering operators.
5	To be able to write the partition function of a system with finite temperature.
6	To be able to write the necessary equations for the self energy and electron phonon interaction of electron.

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
P1	4	4	4	4	4	3
P2	4	4	4	4	3	3
P3	5	5	5	4	4	4
P4	4	5	4	5	4	4
P5	4	5	4	5	4	4
P6	4	4	4	4	3	5
P7	5	5	4	5	4	3
P8	5	4	4	5	4	3