AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Advanced Atomic and Molecular Physics I								
Course Code	FZK523		Couse Level	Second Cycle (Master's Degree)					
ECTS Credit	6	Workload	150 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To teach atom structure, atomic spectroscopy and application fields of atomic spectroscopy.								
Course Content	Single-electron and multi-electron atom structures, fine and hyperfine structure, Zeeman effect, Hund's rules, perturbation, atomic spectroscopy and its applications.								
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	15
Final Examination	1	60
Attending Lectures	14	10
Assignment	5	15

Recommended or Required Reading	
1	Atom ve molekül fiziği, B. H. Bransden and C. J. Joachain
2	Atomic Phyics, Dimitry Budker, Derek F. Kimball, David P. Demille
3	Advances in atomic, molecular and optical physics, Benjamin Bederson, Harbert Walther
4	Introduction to Quantum Mechanics, R. H. Dicke, J. P. Wittke

Week	Weekly Detailed Course Contents	
1	Theoretical	Introduction of atomic physics and atomic structure
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Chapter 1 and 2
2	Theoretical	One-electron atoms
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Chapter 3
3	Theoretical	Interaction of one-electron atoms with electromagnetic radiation
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Chapter 4
4	Theoretical	Many-electron atoms
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Chapter 6 and 7
5	Theoretical	Interaction of many-electron atoms with electromagnetic radiation
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Chapter 8
6	Theoretical	Thin and extremely thin structure , Zeeman effect
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Section 5.1 and 5.2
7	Theoretical	Spin-orbit interaction
	Preparation Work	Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain Section 5.3
8	Intermediate Exam	Midterm Exam
9	Theoretical	Stark effect
	Preparation Work	Atom ve molekül fiziği, B. H. Bransden and C. J. Joachain Section 5. 4
10	Theoretical	Hund rules
	Preparation Work	Atom ve molekül fiziği, B. H. Bransden and C. J. Joachain Chapter 5 section 5
11	Theoretical	Perturbation theory (summary)
	Preparation Work	Introduction to Quantum Mechanics, R. H. Dicke, J. P. Wittke Chapter 14

12	Theoretical	Applications of perturbation theory to atomic physics
	Preparation Work	Introduction to Quantum Mechanics, R. H. Dicke, J. P. Wittke Chapter 14
13	Theoretical	Atomic spectroscopy
	Preparation Work	Atomic Phyics, Dimitry Budker, Derek F. Kimball, David P. Demille Chapter 8 section 1
14	Theoretical	Application areas of atomic spectroscopy (I)
	Preparation Work	Advances in atomic, molecular and optical physics, Benjamin Bederson, Harbert Walt Chapter 2
15	Theoretical	Application areas of atomic spectroscopy II
	Preparation Work	Advances in atomic, molecular and optical physics, Benjamin Bederson, Harbert Walther Chapter 2
16	Final Exam	Final Exam

Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	2	3	70
Assignment	7	5	2	49
Midterm Examination	1	6	3	9
Final Examination	1	17	5	22
			Total Workload (Hours)	150
			[Total Workload (Hours) / 25*] = **ECTS**	6

**25 hour workload is accepted as 1 ECTS*

Learning Outcomes

1	To be able to learn the structure of atom
2	To be able to learn the interaction of atom with magnetic field
3	To be able to analyse the interactions occuring in the atom
4	To be able to learn the difference between the quantum mechanics and the classical mechanics
5	To be able to learn the atomic spectroscopy concept and analysing the applications of It.

Programme Outcomes *(Physics Master)*

1	The student should conceive the concepts in physics and may apply them on her/his own
2	The student should be able to conceive the relationship between the different physics laws and integrity of them and apply them in solving different physics problems
3	The student should know the basic principles of classical, quantum and relativistic physics and use them in the solutions of problems
4	The student should be able to do research in a specific area of physics
5	The student should be able to prepare reports on papers on the subject of her/his research and present her/his research subject in scientific conferences
6	The student should be able to explain the relationship between complicated problems and basic physics laws.
7	The student should be able to use computers for solving complicated physics problems
8	The student should be able to interrelate between the theory and the experiment. If she/he is experimentalist he/she has to explain the theory behind her/his work. If she /he is a theorist she/he should has to know the experiments in her/his subject.

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

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