



AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

Course Title		Group Theory For Physics							
Course Code		FİZ423		Course Level		First Cycle (Bachelor's Degree)			
ECTS Credit	7	Workload	171 (<i>Hours</i>)	Theory	3	Practice	0	Laboratory	0
Objectives of the Course		To introduce the group theory which provides necessary mathematics for investigating symmetries of the nature							
Course Content		Groups, symmetries in quantum mechanics, space and time							
Work Placement		N/A							
Planned Learning Activities and Teaching Methods				Explanation (Presentation), Discussion					
Name of Lecturer(s)									

Assessment Methods and Criteria

Method	Quantity	Percentage (%)
Midterm Examination	1	30
Final Examination	1	70
Quiz	10	10

Recommended or Required Reading

1	Symmetry in Physics (J.P. Elliot, P.G. Dawber)
2	Group Theory in Physics (Wu-Ki Tung)

Week	Weekly Detailed Course Contents	
1	Theoretical	Groups and their properties
2	Theoretical	A short summary of Linear Algebra and Vector spaces
3	Theoretical	Group Representations
4	Theoretical	The explanation of group representations with specific examples
5	Theoretical	Symmetries in Quantum Mechanics
6	Theoretical	Molecular Vibrations
7	Theoretical	Continuous groups and their representations
8	Intermediate Exam	Midterm exam
9	Theoretical	Angular momentum and the R^3 group
10	Theoretical	Point groups and their application to Crystal structures
11	Theoretical	Isospin and the SU2 group
12	Theoretical	The group SU3 and its application to elementary particles
13	Theoretical	irreducible representations of SU3 groups
14	Theoretical	Elementary particles and supermultiplets
15	Theoretical	Space and Time

Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	5	3	112
Quiz	10	2	2	40
Midterm Examination	1	5	2	7
Final Examination	1	10	2	12
Total Workload (Hours)				171
[Total Workload (Hours) / 25*] = ECTS				7

*25 hour workload is accepted as 1 ECTS

Learning Outcomes

1	The student should be able to give the mathematical definition of a group.
2	The student should be able to understand whether a set is a group under a certain operation



3	The student should be able to explain the relationship between the concepts group and symmetry
4	student should be able to define the concept of class in group theory.
5	The student should be able to dissociate a group into its subclasses and find the group structure of simple molecules.
6	The student should know the group representations of angular momentum.
7	The student should be able to construct the irreducible representations of a group.
8	Students should be able to understand group sets of space and time

Programme Outcomes (Physics)

1	To understand the importance of physics by understanding the general concepts of physics, matter and energy
2	To be able to define the movements of matter and to distinguish the characteristics of movements under different force (potential)
3	Be able to say the meaning of Lagrange and Hamiltonian formulations of the movement and apply them to simple problems,
4	To be able to express the fundamental concepts such as time, space, force, momentum and energy in the movements of matter close to the speed of light and be able to solve and interpret the simple problems related to
5	To be able to establish the relationship between electric and magnetic forces and to be able to illustrate their applications to technology and solve problems related to the movement of particles in electric and magnetic fields
6	Be able to say the basic laws of electromagnetics and apply them to problems, illustrate their applications to simple technology
7	To be able to tell the reasons of the differences between the classical cases and the quantum scale and explain the reasons
8	Explain the concepts of discontinuity, uncertainty, matter-antimatter, indecisiveness of quantum physics with examples and explain simple problems related to the subject.
9	To be able to solve the problems of micro-particles under different simple potentials and be able to say their meanings
10	To be able to establish the relationship between the movements and properties of multi-particle systems and the laws of probability and solve simple problems
11	To be able to illustrate the laws, meanings and applications of thermodynamics and use them
12	Be able to use their knowledge about quantum physics and mechanics in explaining some properties of atoms and nuclei
13	To be able to show the meanings of some theoretical concepts by experimenting, and develop a strong relationship between thought and the real world, develop analytical thinking
14	To be able to apply the meanings of the basic laws of physics, their comprehension of universality and the relations between them and the unity of the laws of nature.
15	Use computer to solve physics problems
16	To be able to understand the problems by using their analytical knowledge skills and to propose solutions by dealing with the laws of physics
17	Be able to use the knowledge of physics to understand new technologies
18	To be able to tell the relations between symmetry and conservation laws in laws of physics

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

	L1
P1	4
P2	3
P3	4

