Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
FİZ4020	**3**	**0**	**0**	**3**	**5**	**E**	**TR**	**4/SPRING**
Course Name (Turkish**)**	Fizikte Grup Teorisi Uygulamaları							
Course Name (English**)**	Applications of Group Theory in Physics							

Unit/Program	Physics Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide a comprehensive examination of the fundamentals of Group Theory seen at the undergraduate level and to provide a more detailed explanation of selected topics in Quantum Mechanics and Solid State Physics, both conceptually and quantitatively.
Course Outline	To provide students with basic knowledge about group theory
Textbook/ Material / Resources	1. Group theory and its application to physical problems by Morton Hamermesh 2. Group theory and its application to the quantum mechanics of atomic spectra by E.Wigner 3. Group Theory and Physics by S. Sternberg
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Gebze Technical University	**Physics**	**Group Theory**	**3-0-0-3; 5**	**E**
Harran University	**Physics**	**Group theory and its applications**	**3-0-0-3; 4**	**E**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Instructors who can teach the course (Title, Name and Surname)	*Signature*

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

Face-to-face courses will be taught under the supervision of the relevant faculty member.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	Abstract Group Theory, Regulation Theorem and Cyclic Groups	
2	Subgroups and Cosets, Finite Order Groups, Conjugated Elements and Class Structure	
3	Group Representations Theory, Quantum Mechanical Applications of Representation Theory	
4	Group of Schrödinger's Equation, Group Theory of Quantum Numbers	
5	Circular Groups and Bloch Teremi, Two-Dimensional Rotation Groups	
6	Physical Applications of Group Theory	
7	Crystal Symmetry Operators, Crystallographic Point Groups	
8	Elementary Representations of the Three-Dimensional Rotation Group	
9	Midterm Exam	
10	Crystal Field Splitting, Spin Effects, Group Theoretical Matrix Element Theorems	
11	Selection Rules and Parity	
12	Symmetry and Group Definitions, Basic Group Concepts	
13	Group representations, Permutations and Symmetric group, Symmetric group representations and products	
14	Symmetry group of H Hamiltonian, Unitary groups, Applications	
15	Final Exam	
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	1	2	2
Self-Study (including pre-class and exam preparation)	14	2	28
Make-up Exam	1	2	2
Experiment and Observation			
Class Participation (Theory)	14	3	42
Homework			
Final Exam Practice	1	2	2
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work	12	3	36
Argument	14	1	14
Application/Practice			
Other			
TOTAL WORKLOAD:			**126**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**5**

Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*		1	2	3	4	5	6	7	8	9	10	11
1	To be able to solve different problems that may be encountered in Solid State Physics and Quantum Mechanics with the Group Theory method	**5**	**5**	**5**	**4**	**3**	**3**	**4**	**5**	**5**	**3**	**3**
2	To be able to define the concepts of group theory	**5**	**5**	**5**	**4**	**3**	**3**	**4**	**5**	**5**	**3**	**3**
3	Learning about atoms and their interactions	**5**	**5**	**5**	**4**	**3**	**3**	**4**	**5**	**5**	**3**	**3**

Organizer: Prof. Dr. Niyazi BULUT
Preparation Date: 20.05.2024