Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Theory Of Spinors	FZ5010		3 + 0	3.0	7.5

Prerequisites	None

Language of Instruction	Turkish
Course Level	Second Cycle
Course Type	Elective
Mode of delivery	Face to face
Course Coordinator	Prof. Dr. İsmail TARHAN
Instructors	Prof. Dr. İhsan YILMAZ
Assistants	
Course Objectives	Group theory and spinors, rotational groups, Euler angles, Lorentz groups, special relativity, theory of The main objective of this course is to provide informations on Schrödinger-Pauli, Pauli spinors matrices, Dirac theory and Dirac spinors, applications in the electronic structure of atoms and molecules.
Course Content	The main topics of the course intent are group theory and spinors, rotational group, Euler angles and their applications, Linear operators, spinor representation of groups, unitary representations, Lorentz groups, special relativity, Maxwell equations in curved space-time, relations between spinors and tensors, the electromagnetic field spinors, quasi-relativistic quantum mechanics, Schrödinger-Pauli equations, Pauli spinors matrices, Dirac group theory and spinors, Dirac equation, Dirac spinors matrices, Dirac-Hartree-Fock equations, Dirac-Hartree-Fock-Roothaan equations, Spinor basis functions in the solution of Dirac equation, Physical applications.
Course Learning Outcomes	1) Analyze the solution of Dirac equation and calculation of relativistic properties. 2) Describe the concept of spinor. 3) Write equations of Dirac-Hatree-Fock-Rothan 4) Interpret Pauli spinor matrices 5) Apply Dirac group theory and spinor matrices

WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Group theory and spinors	Oral lectures with interactive discussions, researches and homeworks.	

Quick Access

Physics (Master)
- Qualification Awarded
- Level of Qualification
- Qualification Requirements and Regulations
- Specific Admission Requirements
- Recognition of Prior Learning
- Profile of the Program
- Program Key Learning Outcomes
- Occupational Profile of Graduates
- Access to Further Studies
- Course Structure & Credits
- Exam Regulations & Assessment & Grading
- Graduation Requirements
- Mode of Study
- Programme Director(or Equivalent)
- Evaluation Questionnaire
- TYYÇ

Course Information
- Course Information
- Weekly Course Content
- Resources
- Course Category
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

2. Week	Rotational group, Euler angles and their applications	Oral lectures with interactive discussions, researches and homeworks.	
3. Week	Linear operators, spinor representation of groups, Unitary representations	Oral lectures with interactive discussions, researches and homeworks.	
4. Week	Lorentz groups, special relativity	Oral lectures with interactive discussions, researches and homeworks.	
5. Week	Maxwell equations in curved space-time	Oral lectures with interactive discussions, researches and homeworks.	
6. Week	Relations between spinors and tensors	Oral lectures with interactive discussions, researches and homeworks.	
7. Week	The electromagnetic field spinors	Oral lectures with interactive discussions, researches and homeworks.	
8. Week	Mid-term Exam	Written Exam	
9. Week	Quasi-relativistic quantum mechanics	Oral lectures with interactive discussions, researches and homeworks.	
10. Week	Schrödinger-Pauli equations, Pauli spinors matrices	Oral lectures with interactive discussions, researches and homeworks.	
11. Week	Dirac group theory and spinors, Dirac equation, Dirac spinors matrices	Oral lectures with interactive discussions, researches and homeworks.	
12. Week	Dirac-Hartree-Fock equations	Oral lectures with interactive discussions, researches and homeworks.	
13. Week	Dirac-Hartree-Fock-Roothaan denklemleri	Oral lectures with interactive discussions, researches and homeworks.	
14. Week	Spinor basis functions in the solution of Dirac equation	Oral lectures with interactive discussions, researches and homeworks.	
15. Week	Applications in physics	Oral lectures with interactive discussions, researches and homeworks.	
16. Week	Final Exam	Oral lectures with interactive	

		discussions, researches and homeworks.	

RESOURCES

Recommended Sources
The Theory of Spinors: An Introduction, Moshe Carmeli, Shimon Malin, World Scientific Publishing Company
The Theory of Spinors, Élie Cartan, Courier Dover Publications

ASSESSMENT

Measurement and Evaluation Methods and Techniques
Mid-term exam + Assignment + Research & Project and Presentation 40%, Final Exam 60%

COURSE CATEGORY

Course Category	Percentage
Support Courses	% 100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2	DK3	DK4	DK5
PY1	3	3	3	3	2	2
PY2	4	5	4	3	4	4
PY3	4	5	5	4	4	4
PY4	4	4	3	4	4	3
PY5	4	5	4	4	4	4
PY6	3	3	3	2	3	3
PY7	5	5	4	4	3	3
PY8	4	4	4	4	3	3
PY9	4	4	3	3	4	4
PY10	4	4	4	4	4	4
PY11	5	4	4	5	5	5
PY12	5	5	5	4	4	5
PY13	4	4	4	4	3	3
PY14	4	4	4	3	3	4
PY15	5	4	5	4	5	5

*DK = Course's Contrubution.

	0	1	2	3	4	5
Level of contribution	None	Very Low	Low	Fair	High	Very High

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ECTS CREDITS AND COURSE WORKLOAD

Event	Quantity	Duration (Hour)	Total Workload (Hour)
Class Hours (14 weeks)	14	3	42
Final Exam Preparation	1	12	12

Mid Term Exam Preparation	1	12	12
Preliminary Study	14	3	42
Assignment 1	12	3	36
Final Exam	1	3	3
Further Study	14	3	42
Mid Term Exam 1	1	3	3
Total Workload			192
Total Workload / 25.5 (s)			7.53
ECTS Credit of the Course			8