



# Çanakkale Onsekiz Mart University

Education Information System

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## Course Information

### COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Quantum Field Theory I	FZ5033		3 + 0	3.0	7.5

<b>Prerequisites</b>	None
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<b>Language of Instruction</b>	Turkish
<b>Course Level</b>	Second Cycle
<b>Course Type</b>	Elective
<b>Mode of delivery</b>	Face to face
<b>Course Coordinator</b>	Assist. Prof. Dr. Ayşe KÜÇÜKARSLAN
<b>Instructors</b>	Assist. Prof. Dr. Ayşe KÜÇÜKARSLAN Prof. Dr. İhsan YILMAZ
<b>Assistants</b>	
<b>Course Objectives</b>	To investigate and understand fundamentals of quantum field theory
<b>Course Content</b>	Classical field theory, Canonical solutions of Klein-Gordon, Dirac and Maxwell fields equations, Interacting fields, perturbation theory and Feynman diagrams, Elementary processes of quantum electrodynamics, approximation methods, Divergences, regularization and renormalization
<b>Course Learning Outcomes</b>	1) Define a concept of second quantization 2) Solve single particle wave equations 3) Formulate path integral of quantum mechanics 4) Determine lagrangien of particle mechanics 5) Solve Dirac equation and Klein-Gordon equation

### WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Introduction, Classical field theory	Lecture, Problem solving, Homework	
2. Week	Classical field theory	Lecture, Problem solving, Homework	
3. Week	Maxwell field equations	Lecture, Problem solving, Homework	
4. Week	Canonical solutions of Klein-Gordon field equation	Lecture, Problem solving, Homework	

### 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
- Assessment
- Course Category
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

5. Week	Solutions of Dirac field equations	Lecture, Problem solving, Homework	
6. Week	Second quantization and concept of field	Lecture, Problem solving, Homework	
7. Week	Second quantization of identical boson systems	Lecture, Problem solving, Homework	
8. Week	Quantization of the electromagnetic field without charges	Lecture, Problem solving, Homework	
9. Week	Second quantization of bosons	Lecture, Problem solving, Homework	
10. Week	Meson field and Second quantization of Meson field	Lecture, Problem solving, Homework	
11. Week	Second quantization of identical fermion systems	Lecture, Problem solving, Homework	
12. Week	Quantization of electron-positron field	Lecture, Problem solving, Homework	
13. Week	Basic ideas of a theory of interacting quantum field	Lecture, Problem solving, Homework	
14. Week	Microscopic theory of superconductivity	Lecture, Problem solving, Homework	
15. Week	Repetition of The Overall Subject	Lecture, Problem solving, Homework	
16. Week	Final Exam	Exam	

## RESOURCES

Recommended Sources
Quantum theory of fields, S. Weinberg, 1996, Cambridge Univ. Press, United State America
Relativistic quantum theory, V. B. Berestetskii, E. M. Lifshitz and L. P. Pitaevskii, 1971,Oxford, New York, Pergamon Press
Quantum mechanics, A.S Davydov, 1965, Pergamon Press

## ASSESSMENT

Measurement and Evaluation Methods and Techniques		
Midterm exam, Homework, Final exam		
In-Term Studies	Quantity	Percentage
Mid Term Exam 1	1	30
Assignment 1	1	30
<b>Total</b>	2	60
End-Term Studies	Quantity	Percentage
Final Exam	1	40
<b>Total</b>	1	40
<b>Contribution Of In-Term Studies To Overall Grade</b>		60
<b>End-Term Studies</b>		40
<b>Total</b>		100

## COURSE CATEGORY

Course Category	Percentage
Core Courses	% 100

## CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2	DK3	DK4	DK5
PY1	0	0	0	0	0	0
PY2	4	4	0	0	0	0
PY3	4	4	0	0	0	0
PY4	3	3	0	0	0	0
PY5	0	0	0	0	0	0
PY6	0	0	0	0	0	0
PY7	3	3	0	0	0	0
PY8	3	3	0	0	0	0
PY9	4	4	0	0	0	0
PY10	0	0	0	0	0	0
PY11	0	0	0	0	0	0
PY12	0	0	0	0	0	0
PY13	3	3	0	0	0	0
PY14	3	3	0	0	0	0
PY15	0	0	0	0	0	0

\*DK = Course's Contribution.

	0	1	2	3	4	5
<b>Level of contribution</b>	None	Very Low	Low	Fair	High	Very High

## ECTS CREDITS AND COURSE WORKLOAD

Event	Quantity	Duration (Hour)	Total Workload (Hour)
Final Exam	1	4	4
Mid Term Exam 1	1	3	3
Assignment 1	3	15	45
Class Hours (14 weeks)	14	3	42
Mid Term Exam Preparation	1	25	25
Final Exam Preparation	1	30	30
Further Study	14	3	42
<b>Total Workload</b>			191
<b>Total Workload / 25.5 (s)</b>			7.49
<b>ECTS Credit of the Course</b>			7