

### AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

Course Title Perturbation Applications in Physical Systems								
FİZ441		Couse Level		First Cycle (Bachelor's Degree)				
Workload	176 <i>(Hours)</i>	Theory	3	Practice	0	Laboratory	0	
Introduction to perturbation theory which is the one of the most important approximation methods in physics								
Application of perturbation expansion to the differential equations, Lagrange expansion and its applications, Perturbation in classical mechanics and quantum mechanics.								
N/A								
Planned Learning Activities and Teaching Methods Explanation (Presentation), Discussion								
	Perturbation A FIZ441 Workload Introduction to physics Application of applications , N/A and Teaching	Perturbation Applications in FIZ441 Workload 176 (Hours) Introduction to perturbation physics Application of perturbation e applications , Perturbation in N/A and Teaching Methods	Perturbation Applications in Physical Sys FİZ441 Couse Level Workload 176 (Hours) Theory Introduction to perturbation theory which physics Application of perturbation expansion to t applications, Perturbation in classical me N/A and Teaching Methods Explanation	Perturbation Applications in Physical Systems   FIZ441 Couse Level   Workload 176 (Hours) Theory 3   Introduction to perturbation theory which is the one physics Perturbation expansion to the different applications, Perturbation in classical mechanics at N/A Explanation (Presentation)	Perturbation Applications in Physical Systems   FIZ441 Couse Level First Cycle (Backer of the state of the construction of the const	Perturbation Applications in Physical Systems   FIZ441 Couse Level First Cycle (Bachelor's Date of the construction of the construct	Perturbation Applications in Physical Systems   FIZ441 First Cycle (Bachelor's Degree)   Workload 176 (Hours) Theory 3 Practice 0 Laboratory   Introduction to perturbation theory which is the one of the most important approximation method physics Introduction to perturbation theory which is the one of the most important approximation method applications, Perturbation to the differential equations, Lagrange expansion and its applications, Perturbation in classical mechanics and quantum mechanics.   N/A Explanation (Presentation), Discussion	

#### **Assessment Methods and Criteria**

Method	Quantity	Percentage (%)		
Midterm Examination	1	40		
Final Examination	1	70		

## **Recommended or Required Reading**

1	Quantum Mechanics (Tekin Dereli, Abdullah Verçin)
2	Introduction to Quantum Mechanics (David J. Griffiths)

Week	Weekly Detailed Cours	led Course Contents				
1	Theoretical	What is perturbation ?				
2	Theoretical	Perturbation expansion				
3	Theoretical	Application of perturbation expansion to the differential equations				
4	Theoretical	Lagrange expansion				
5	Theoretical	Applications of Lagrange expansion				
6	Theoretical	Perturbation on boundary value problem				
7	Theoretical	Perturbation in classical mechanics				
8	Intermediate Exam	Midterm Exam				
9	Theoretical	Anharmonic oscillator				
10	Theoretical	WKB approximation				
11	Theoretical	Time-independent perturbation in quantum mechanics				
12	Theoretical	Selection rules				
13	Theoretical	Perturbation in degenerative systems				
14	Theoretical	Time dependent perturbation				
15	Theoretical	Periodic perturbation and Fermi's golden rule				

### **Workload Calculation**

Activity	Quantity		Preparation	Duratio	on	Total Workload
Lecture - Theory	14		2.5	3		77
Midterm Examination	1		35	2		37
Final Examination	1		60	2		62
Total Workload (Hours) 176						
[Total Workload (Hours) / 25*] = ECTS 7						7
*25 hour workload is accepted as 1 ECTS						

#### Learning Outcomes

1 Ability of solving the nonlinear differential equations by using perturbation methods

2 Ability of solving problems in classical mechanics which do not have exact solution through perturbation method in the mean of approximation.



3	Ability of solving problems in quantum mechanics which do not have exact solution through perturbation method in the mean of approximation.
4	Be able to have knowledge about nonlinear equations
5	Be able to solve physics problems involving nonlinear equations

# Programme Outcomes (Physics)

Progra	amme 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	L2	L3
P1		2	2
P2		3	3
P7		2	2
P8	3	2	4
P9	3	2	5
P10	3	2	5
P12	3	2	5
P14	1	2	3
P15	2	2	2
P16	3	3	3
P18	2	2	3

