



## AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

Course Title		Nonlinear Vibrations and Waves							
Course Code		FİZ434		Couse Level		First Cycle (Bachelor's Degree)			
ECTS Credit	7	Workload	180 ( <i>Hours</i> )	Theory	3	Practice	0	Laboratory	0
Objectives of the Course		To understand nonlinear vibrations and waves and relations with nature also understand the difference of waves which propagate in linear and nonlinear medium.							
Course Content		To teach the properties of nonlinear and linear vibrations and waves. Also apply them on natural events.							
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	2	10

### Recommended or Required Reading

1	Waves (Berkeley) S. Frank , Jr.Crowford
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Week	Weekly Detailed Course Contents	
1	Theoretical	The difference between linear and nonlinear vibrations and their equations
2	Theoretical	The difference between linear and nonlinear solutions of equations
3	Theoretical	modes of coupled linear and nonlinear vibrations
4	Theoretical	reasons of changing in frequency of modes and the meaning of them.
5	Theoretical	nonlinear modes and principle of superposition
6	Theoretical	examples of wave equations in linear mediums, their properties and solutions.
7	Theoretical	Wave equation nonlinear mediums and their difference from in which linear mediums.
8	Intermediate Exam	Midterm
9	Theoretical	To introduce with simple nonlinear wave equations
10	Theoretical	discussion on solutions of nonlinear wave equations
11	Theoretical	some applications of nonlinear wave equations in physics
12	Theoretical	The reasons of interactions with modes while nonlinear waves propagates.
13	Theoretical	investigation of nonlinear waves in traffic
15	Theoretical	The investigation of linear waves in conduction loops

### Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	8	2	140
Assignment	1	5	2	7
Quiz	3	2	1	9
Midterm Examination	1	10	2	12
Final Examination	1	10	2	12
Total Workload (Hours)				180
[Total Workload (Hours) / 25*] = ECTS				7

\*25 hour workload is accepted as 1 ECTS

### Learning Outcomes

1	It should be said and written that linear and nonlinear vibrations and their properties.
2	It should be said how the nonlinear differential equations can be solved and can be used any method for solution.
3	students should obtain the difference between the solutions of linear and nonlinear coupled systems and modes,



4	students should relate modes and waves of many body linear and nonlinear coupled systems
5	To be able to establish a relation between the modes and waves of linear and nonlinear coupled systems with many particles.
6	To be able to write linear and nonlinear wave equations and show distinctions between them.
7	To be able to show the differences in the propagation of linear and nonlinear waves and express how these differences mathematically change with the amplitudes of the waves.
8	To be able to say why the modes interact each other in nonlinear waves and to express the facts result in this interaction.

### 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	L2	L3	L4	L5	L6	L7	L8
P1						4	3	
P2			4	4		4	5	4
P4			4					
P5								4
P6								4
P11								4
P13					4		4	
P14		4			4			
P16								4
P17	4	3						4

