AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title		One Dimensional Nonlinear Crystal Lattices							
Course Code		FZK522		Couse Level		Second Cycle (Master's Degree)			
ECTS Credit	6	Workload	151 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course		To provide the students abilities, concepts and investigation methods on linear and nonlinear crystal lattice, wave-wave interactions and its application of the results.							
Course Content		Monatomic nonlinear lattice, diatomic nonlinear lattice, localised mod, nonlinearity, linear and nonlinear fonons, resonance conditions, initial conditions, Fourier analysis, Wavelet analysis, harmonic ve anharmonic lattice vibrations, wave-wave interactions.							
Work Placement									
Planned Learning Activities and Teaching Methods				Explanation (Presentation), Discussion, Individual Study					
Name of Lecturer(s)									

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	30
Final Examination	1	60
Quiz	2	10

Recommended or Required Reading	
1	The Crystal Lattice, A.M. Kossevich,Wiley-VCH,New York
2	The Mechanics of Nonlinear Systems,A.Manevich,.Manevich,Imperial College Press,London

Week	Weekly Detailed Course Contents	
1	Theoretical	Vibrations of dimensional linear and nonlinear lattice systems and their properties. (summary)
	Preparation Work	ISSP , Kittel : Phonons and lattice vibrations, Chapter 5
2	Theoretical	Comparison of linear and nonlinear vibrations
	Preparation Work	Waves Called Solitons, Remoissenet: Chapter 2-3
3	Theoretical	One dimensional nonlinear mono atomic and diatomic vibrations and their properties
	Preparation Work	ISSP ,Kittel :Phonons and lattice vibrations, Chapter 6
4	Theoretical	Introduction to solitons waves in nonlinear cristals
	Preparation Work	Waves Called Solitons, Remoissenet: Chapter 4
5	Theoretical	Properties of solitons and comparison to linear waves
	Preparation Work	Waves Called Solitons, Remoissenet: Chapter 4
6	Theoretical	Some examples to nonlinear waves
	Preparation Work	Linear and Nonlinear Waves,Whitham:Chapter 2-4
7	Theoretical	Introduction to wave interactions in cristals
	Preparation Work	The Crystal lattice, M. Kossevich: Chapter 7
8	Intermediate Exam	Midterm Exam
9	Theoretical	Investigation of condition for wave interactions
	Preparation Work	ISSP ,Kittel :Phonons and lattice vibrations, Chapter 6
10	Theoretical	Fourier analysis and its applications
	Preparation Work	
11	Theoretical	Investigation of wave interaction by Fourier transforms
	Preparation Work	Linear and Nonlinear Waves,Whitham:Chapter 15.6
12	Theoretical	Wavelet analysis and its applications
	Preparation Work	MatLab ToolBox: Fourier and Wavevelet Transform investigation
13	Theoretical	Investigation of wave interaction by Wavelet transform
	Preparation Work	MatLab ToolBox: Fourier and Wavevelet Transformun investigation
14	Theoretical	Localized modes:Numerical example
	Preparation Work	The Crystal lattice, M. Kossevich: Chapter 12

15	Theoretical	Chaos in nonlinear oscilators
	Preparation Work	The Crystal lattice, M. Kossevich: Chapter 12
16	Final Exam	Final Exam

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	3	3	84
Quiz	3	8	1	27
Midterm Examination	1	18	2	20
Final Examination	1	18	2	20
			Total Workload (Hours)	151
			[Total Workload (Hours) / 25*] = **ECTS**	6
25 hour workload is accepted as 1 ECTS				

Learning Outcomes	
1	To be able to tell the physical difference between linear and nonlinear systems
2	To be able to distinguish difference of linear and nonlinear vibrations in one dimensional lattice.
3	To be able to learn basic concepts such as localized mod, fonon band.
4	To be able to calculate with Fourier and Wavelet analysis methods.
5	To be able to explain the numerical example and chaos in non linear oscillator concepts and to be able to perform analyze by means of those

Programme Outcomes *(Physics Master)*	
1	The student should conceive the concepts in physics and may apply them on her/his own
2	The student should be able to conceive the relationship between the different physics laws and integrity of them and apply them in solving different physics problems
3	The student should know the basic principles of classical, quantum and relativistic physics and use them in the solutions of problems
4	The student should be able to do research in a specific area of physics
5	The student should be able to prepare reports on papers on the subject of her/his research and present her/his research subject in scientific conferences
6	The student should be able to explain the relationship between complicated problems and basic physics laws.
7	The student should be able to use computers for solving complicated physics problems
8	The student should be able to interrelate between the theory and the experiment. If she/he is experimentalist he/she has to explain the theory behind her/his work. If she /he is a theorist she/he should has to know the experiments in her/his subject.

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5
P1	4	5	5	5	5
P2	5	5	4	5	4
P3	4	4	5	5	5
P4	4	3	3	3	3
P5	2	2	2	2	2
P6	4	4	4	4	4
P7	2	5	3	3	4
P8	2	4	2	2	2