AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Nonlinear Dynamics and Chaos								
Course Code	FZK517		Couse Level	Second Cycle (Master's Degree)					
ECTS Credit	6	Workload	150 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To gain the basic concepts and applications of chaos and nonlinear dynamics								
Course Content	Linear and nonlinear dynamical systems, phase space representation, 1 and 2D flow diagrams, Limit cycle, Lyapunov exponents, Chaos, Fractals								
Work Placement									
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	60
Quiz	2	10

Recommended or Required Reading	
1	Nonlinear Dynamics and Chaos,S.H.Strogatz,
2	Introduction to Nonlinear Dynamics and Chaos, www.cns.gatech.edu/~roman/phys4267/index.html

Week	Weekly Detailed Course Contents	
1	Theoretical	Introduction to linear and nonlinear systems.
	Preparation Work	Nonl. Dyna. and Chaos, www.cns.gatech.edu/~roman/phys4267/index.htm
2	Theoretical	Representation of motion equations in phase space
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.2
3	Theoretical	Flux diagram of one and two dimensional systems
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.2
4	Theoretical	Instability of simple nonlinear systems and chaos
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.9
5	Theoretical	Limit cycle and investigation of system instabilities
	Preparation Work	Nonl. Dyna. and Chaos, www.cns.gatech.edu/~roman/phys4267/index.htm
6	Theoretical	Definition of chaos and its reasons
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.10
7	Theoretical	Perturbation methods for nonlinear dynamical systems
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.7
8	Intermediate Exam	Midterm Exam
9	Theoretical	The meaning of Lyapunov exponents
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.10
10	Theoretical	Calculation of Lyapunov exponents of some systems and chaos
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.10
11	Theoretical	Investigation of some chaotic systems: Lorenz systems
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.6
12	Theoretical	Introduction to Fractals
	Preparation Work	Nonl. Dyna. and Chaos, www.cns.gatech.edu/~roman/phys4267/index.htm
13	Theoretical	Phase space for chaotic systems and fractals
	Preparation Work	Introduction to Nonlinear Dynamics and Chaos, S.H.Strogatz, Ch.11
14	Theoretical	Discussion for the importance of chaotic systems
	Preparation Work	Nonl. Dyna. and Chaos, www.cns.gatech.edu/~roman/phys4267/index.htm
15	Theoretical	Discussion for the relation of chaos with other physics brances
	Preparation Work	Nonl. Dyna. and Chaos, www.cns.gatech.edu/~roman/phys4267/index.htm

16	Final Exam	Final Exam

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	3	3	84
Quiz	2	10	1	22
Midterm Examination	1	18	2	20
Final Examination	1	17	7	24
			Total Workload (Hours)	150
			[Total Workload (Hours) / 25*] = **ECTS**	6
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	To be able to distinguish chaotic systems and analyse their features
2	To be able to understand and feature one and higher dimensional dynamical systems
3	To be able to calculate of Feigenbaum constants and Lyapunov exponents in dissipative dynamical systems
4	To be able to get the insight of chaos paths and analyse the differences and general features of them
5	To be able to construct the relation of chaos concept with the other branches of Physics

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	5
P3	4	4	5	5	4
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