AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Computer Programming in Physics								
Course Code	FİZ206		Couse Level	First Cycle (Bachelor's Degree)					
ECTS Credit	6	Workload	149 *(Hours)*	Theory	2	Practice	0	Laboratory	2
Objectives of the Course	To make the students understand the method of solving problems in physics by using computer and the meanings of solutions								
Course Content	The definitions of first order differential equations, initial conditions and simple numeric solutions, The solution of equations of motion of particle moving in one dimension (Euler), Simple numeric solution of the equations of motions of particle moving in 2 dimensions (Euler), The investigation of circular motion and numeric solution of independent components of the motion, The investigation of mass-spring system and numeric solution of the dependent components of the motion, The comparison of Euler and Runge Kutta methods, The numeric solutions of equations of motion of 1 and 2-dim dynamical systems by Runge-Kutta method, The systematic numeric solution of equations of motion by using sub wares, The definition of boundary condition problems in physics and solution of them by Runge-Kutta method, Random numbers and simple applications of them on integration (Monte-Carlo), Fermat principle, probability and the investigation of refraction of the light, The application of probability laws on particles moving under the effect of different potentials (Path integral), Partial differential equations and numeric solutions, Numeric solutions of basic Schrödinger problems								
Work Placement	N/A								
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Discussion								
Name of Lecturer(s)	Prof. Cesur EKİZ								

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	30
Final Examination	1	70
Assignment	2	10

Recommended or Required Reading	
1	Sayısal Fizik,B.Karaoğlu,Seyir Yayıncılık,2004,İstanbul
2	An Introduction to Computer Simulations Methods,H.Gould,J.Tobochnick,Addison-Wesley,1996,New York
3	Fiziğin Temelleri , David Halliday, Robert Resnick, and Pearl Walker
4	Lectures on Physics I, R. Feynmann

Week	Weekly Detailed Course Contents	
1	Theoretical	The definitions of first order differential equations, initial conditions and simple numeric solutions
2	Theoretical	The solution of equations of motion of particle moving in one dimension (Euler)
3	Theoretical	Simple numeric solution of the equations of motions of particle moving in 2 dimensions (Euler)
4	Theoretical	The investigation of circular motion and numeric solution of independent components of the motion
5	Theoretical	The investigation of mass-spring system and numeric solution of the dependent components of the motion
6	Theoretical	The comparison of Euler and Runge Kutta methods
7	Theoretical	The numeric solutions of equations of motion of 1 and 2-dim dynamical systems by Runge-Kutta method
8	Intermediate Exam	Midterm
9	Theoretical	The systematic numeric solution of equations of motion by using sub wares
10	Theoretical	The definition of boundary condition problems in physics and solution of them by Runge-Kutta method
11	Theoretical	Random numbers and simple applications of them on integration (Monte-Carlo)
12	Theoretical	Fermat principle, probability and the investigation of refraction of the light
13	Theoretical	The application of probability laws on particles moving under the effect of different potentials (Path integral)
14	Theoretical	Partial differential equations and numeric solutions

15	Theoretical	Numeric solutions of basic Schrödinger problems

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	5	4	126
Quiz	2	4	1	10
Midterm Examination	1	3	3	6
Final Examination	1	4	3	7
			Total Workload (Hours)	149
			[Total Workload (Hours) / 25*] = **ECTS**	6
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	Must understand the importance of differential equations in physics
2	Must perform the simple numeric solutions (Euler method) of differential equations
3	Must construct computer programs which solve the equations of motion for one and two dimensional motion
4	Must understand and apply basic computer algorithms
5	Must solve the differential equations of particles under the fact of different forces quantitatively and represent the results physically
6	Must solve dynamic problems by using more complex methods (Runge-Kutta)
7	Must model the physical phenomenon related to probability laws by using the computer's ability of producing random number
8	Must represent and solve the equations of motions of many particle systems in which there exists a interaction potential by using Euler and Runge-Kutta methods that have learned

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	L7	L8
P1	4	4					
P2	4	4	4				
P5	5	5	4	4	4		4

P6	5		4	4	4	4	