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	150 *(Hours)*	Theory	2	Practice	0	Laboratory 2
Objectives of the Course	The aim of this course is to teach the fundamentals of Fortran(or Python) programming language and to enable students to solve the problems they will encounter during their physics undergraduate education with numerical methods.							
Course Content	Fundamentals of Fortran and Python programming language, Series expansions, differentiation and integration, solution of simple differential equations, solution of differential equations for two and three dimensional systems, solution of Eigenvalue Eigenvector problem, Random Numbers and their simple applications in integration (Monte Carlo Method), Solution of Basic Statistical Physics Problems and Quantum Mechanics							
Work Placement	N/A							
Planned Learning Activities and Teaching Methods			Explanation (Presentation), Discussion, Case Study, Problem Solving					
Name of Lecturer(s)								

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

Recommended or Required Reading	
1	Fortran ve Python ile Sayısal Fizik, B. Karaoğlu, Seçkin Yayıncılık, Ankara 2013
2	Computational Physics: Problem Solving with Python, Rubin H. Landau, M. J. Paez, C.C. Bordeianu, Wiley
3	Numerical Methods for Physics, A. L. Garcia
4	An Introduction to Computer Simulations Methods,H.Gould,J.Tobochnick,Addison-Wesley,1996,New York
5	Fiziğin Temelleri , David Halliday, Robert Resnick, and Pearl Walker

Week	Weekly Detailed Course Contents	
1	Theoretical	Python Installation with Anaconda and alternatives
2	Theoretical	Series Expansions, interpolation and data fitting
3	Theoretical	Derivatives
4	Theoretical	Integrals
5	Theoretical	Differential Equations I: Fundamental and 1-Dimensional problems
6	Theoretical	1 -Dimensional Problems
7	Theoretical	Differential Equations II: Multidimensional problems
8	Theoretical & Practice	Review (Midterm exam)
9	Theoretical	Eigenvalue Problems
10	Theoretical	Random numbers and their simple applications in integration (Monte-Carlo)
11	Theoretical	Fermat principle, probability and the investigation of refraction of the light
12	Theoretical	The application of probability laws on particles moving under the effect of different potentials (Path integral)
13	Theoretical	Partial differential equations and numeric solutions
14	Theoretical	Numerical solutions of simple Schrödinger problems

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	0	4	56
Assignment	2	0	20	40
Midterm Examination	1	15	2	17

Final Examination	1	35	2	37
Total Workload (Hours)				150
[Total Workload (Hours) / 25*] = **ECTS**				6
25 hour workload is accepted as 1 ECTS				

Learning Outcomes	
1	can provide basic information about the Fortran or Python programming languages.
2	be able to perform the simple numeric solutions (Euler method) of differential equations.
3	can make simple computer algorithms using the Fortran or Python programming languages.
4	be able to solve dynamic problems by using more complex methods (Runge-Kutta).
5	be able to model the physical phenomenon related to probability laws by using the computer's ability of producing random number.
6	can explain random events and Monte Carlo simulations.

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
P1	4	4			
P2	4	4	4		
P5	5	5	4	4	4
P6	5		4	4	4