



## AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

|  |   |   |                      |  |   |                                 |   |            |   |
|--|---|---|----------------------|--|---|---------------------------------|---|------------|---|
| Course Title                                     |   | Nuclear Physics   |                      |  |   |                                 |   |            |   |
| Course Code                                      |   | FİZ422  |                      | Course Level                           |   | First Cycle (Bachelor's Degree) |   |            |   |
| ECTS Credit                                      | 7 | Workload  | 175 ( <i>Hours</i> ) | Theory                                 | 3 | Practice                        | 0 | Laboratory | 0 |
| Objectives of the Course                         |   | Introducing the basic aspects of Nuclear Physics. Understanding the nuclear structure and the properties.   |                      |  |   |                                 |   |            |   |
| Course Content                                   |   | Properties of nuclear structure, properties of nuclear interaction, nuclear models, nuclear decay, theories of alpha, beta and gamma decay, nuclear reactions and to solve problems about related topics. |                      |  |   |                                 |   |            |   |
| Work Placement                                   |   | N/A   |                      |  |   |                                 |   |            |   |
| Planned Learning Activities and Teaching Methods |   |   |                      | Explanation (Presentation), Discussion |   |                                 |   |            |   |
| Name of Lecturer(s)                              |   | Assoc. Prof. Melis GÖKÇE  |                      |  |   |                                 |   |            |   |

### Assessment Methods and Criteria

| Method              | Quantity | Percentage (%) |
|---------------------|----------|----------------|
| Midterm Examination | 1        | 20             |
| Final Examination   | 1        | 70             |
| Quiz                | 4        | 10             |
| Assignment          | 4        | 10             |

### Recommended or Required Reading

|   |   |
|---|---|
| 1 | Introductory Nuclear Physics, Kenneth S. Krane, 1987.                     |
| 2 | An Introduction to Nuclear Physics, W.N.Cottingham, D.A. Greenwood, 2001. |

| Week | Weekly Detailed Course Contents |  |
|------|---------------------------------|--|
| 1    | Theoretical                     | Historical overview and basic aspects. |
| 2    | Theoretical                     | Properties of nuclear structure        |
| 3    | Theoretical                     | Properties of nuclear structure        |
| 4    | Theoretical                     | Elementary quantum mechanics           |
| 6    | Theoretical                     | Nuclear Models I                       |
| 7    | Intermediate Exam               | MIDTERM EXAM                           |
| 8    | Theoretical                     | Nuclear Models II                      |
| 9    | Theoretical                     | Nuclear decay and Radioactivity        |
| 10   | Theoretical                     | Alpha decay                            |
| 11   | Theoretical                     | Beta decay                             |
| 12   | Theoretical                     | Gamma decay                            |
| 13   | Theoretical                     | Nuclear reactions                      |
| 14   | Theoretical                     | Fission and Fusion                     |
| 15   | Theoretical                     | Measurement of nuclear reaction        |

### Workload Calculation

| Activity                              | Quantity | Preparation | Duration | Total Workload |
|---------------------------------------|----------|-------------|----------|----------------|
| Lecture - Theory                      | 14       | 4           | 3        | 98             |
| Assignment                            | 4        | 5           | 2        | 28             |
| Quiz                                  | 4        | 2.5         | 0.5      | 12             |
| Midterm Examination                   | 1        | 15          | 2        | 17             |
| Final Examination                     | 1        | 18          | 2        | 20             |
| Total Workload (Hours)                |          |             |          | 175            |
| [Total Workload (Hours) / 25*] = ECTS |          |             |          | 7              |

\*25 hour workload is accepted as 1 ECTS



**Learning Outcomes**

|   |  |
|---|--|
| 1 | Ability to interpret the fundamental physics, electromagnetic, quantum mechanics and statistical physics knowledge with a different point of view. |
| 2 | Ability to comprehend the mechanism of nuclear decay.  |
| 3 | Ability to learn the phenomena of the interaction between nucleons.  |
| 4 | Ability to explain the properties of a nucleus by using simple models and to solve problems.   |
| 5 | Ability to comprehend the radioactive decay law and to solve problems.   |
| 6 | Ability to comprehend the theories of decay modes and to solve problems.   |
| 7 | Ability to learn basic properties of nuclear reactions and to solve problems.  |

**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 |
|-----|----|----|----|----|----|----|----|
| P6  |    | 4  |    |    |    |    |    |
| P7  |    | 4  |    |    |    |    |    |
| P8  |    |    | 3  |    |    |    |    |
| P12 |    | 5  | 4  | 5  |    |    |    |
| P13 |    |    |    |    | 3  |    |    |
| P14 | 3  |    |    |    |    |    |    |
| P17 |    |    |    |    |    | 4  |    |
| P18 |    |    |    |    |    |    | 4  |

