



## AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

|  |   |  |                      |  |   |                                 |   |            |   |
|--|---|--|----------------------|--|---|---------------------------------|---|------------|---|
| Course Title                                     |   | Relative Physics   |                      |  |   |                                 |   |            |   |
| Course Code                                      |   | FİZ333   |                      | Couse Level                            |   | First Cycle (Bachelor's Degree) |   |            |   |
| ECTS Credit                                      | 6 | Workload   | 156 ( <i>Hours</i> ) | Theory                                 | 3 | Practice                        | 0 | Laboratory | 0 |
| Objectives of the Course                         |   | 1. To discuss relativity phenomenon<br>2. To represent Einstein relativity theory<br>3. To compare classical and special relativity theories |                      |  |   |                                 |   |            |   |
| Course Content                                   |   | Galileo transformation, Lorentz transformation, special relativity, general relativity   |                      |  |   |                                 |   |            |   |
| 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             |
| Quiz                | 10       | 10             |

### Recommended or Required Reading

|   |   |
|---|---|
| 1 | The special theory of relativity (David Bohm) |
|---|---|

| Week | Weekly Detailed Course Contents |   |
|------|---------------------------------|---|
| 1    | Theoretical                     | Relativity phenomenon                                 |
| 2    | Theoretical                     | Galilean relativity (noninertial systems)             |
| 3    | Theoretical                     | Motion in inertial motion                             |
| 4    | Theoretical                     | Applications of centrifugal and Coriolis forces       |
| 5    | Theoretical                     | Axioms of special relativity                          |
| 6    | Theoretical                     | Lorentz transformations                               |
| 7    | Theoretical                     | Length contraction and time dilation                  |
| 8    | Intermediate Exam               | Midterm Exam  |
| 9    | Theoretical                     | Doppler effect and twin paradox                       |
| 10   | Theoretical                     | Relative momentum and energy                          |
| 11   | Theoretical                     | Unchangeable quantities under Lorentz transformations |
| 12   | Theoretical                     | Four vector   |
| 13   | Theoretical                     | Tensors   |
| 14   | Theoretical                     | Tensors   |
| 15   | Theoretical                     | A quick insight to general relativity                 |

### Workload Calculation

| Activity                              | Quantity | Preparation | Duration | Total Workload |
|---------------------------------------|----------|-------------|----------|----------------|
| Lecture - Theory                      | 14       | 2           | 3        | 70             |
| Quiz                                  | 10       | 3           | 1        | 40             |
| Midterm Examination                   | 1        | 18          | 1.5      | 19.5           |
| Final Examination                     | 1        | 25          | 1.5      | 26.5           |
| Total Workload (Hours)                |          |             |          | 156            |
| [Total Workload (Hours) / 25*] = ECTS |          |             |          | 6              |

\*25 hour workload is accepted as 1 ECTS

### Learning Outcomes

|   |                                |
|---|--------------------------------|
| 1 | To know Galileo transformation |
|---|--------------------------------|



|   |  |
|---|--|
| 2 | To know Lorentz transformation   |
| 3 | Must define inertial and noninertial reference systems and say their importance in physics   |
| 4 | Must compare space-time phenomenon of special relativity and general relativity  |
| 5 | Must know two axioms of special relativity   |
| 6 | Must solve basic problems about length contraction and time dilation phenomenon  |
| 7 | Must represent basic phenomenon such that force, momentum, energy and time for matter's motions near to light velocity and must solve and discuss basic problems related with these subjects |
| 8 | Must realize the equation if it alters under Lorentz transformations or not  |

### 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 | L8 |
|-----|----|----|----|----|----|----|----|----|
| P1  | 3  | 3  | 4  | 3  | 3  | 3  | 3  | 3  |
| P2  |    |    | 4  | 3  |    |    |    |    |
| P3  |    |    | 2  |    |    |    |    |    |
| P4  | 4  | 5  | 5  | 5  | 5  | 5  | 5  | 5  |
| P5  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |
| P6  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |
| P10 | 2  | 2  | 2  |    |    |    |    |    |
| P14 | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |
| P16 | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |
| P17 |    |    |    | 3  |    |    |    |    |
| P18 | 4  | 4  | 3  | 3  |    | 3  | 4  | 5  |

