**Courses – ECTS Credits**

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|  |
| Code | Course Name | ECTS | T+U+L | T/S | Language |
| Fall Semester |
| 522103301 | [NEUROBIOPHYSICS I](#D522101301) | 7.5 | 3+0+0 | COMPULSORY | TURKISH |
| 522103306 | [EVOKED POTENTIALS AND DATA COLLECTION](#D522101306) | 7.5 | 2+2+0 | COMPULSORY | TURKISH |
| 522103302 | [MATHEMATICAL MODELS IN BIOPHYSICS](#D522101302) | 7.5 | 2+0+0 | ELECTIVE | TURKISH |
| 522103303 | [BIOMECHANICS II](#D522101303) | 7.5 | 3+0+0 | ELECTIVE | TURKISH |
| 522103304 | [ELECTROCARDIOGRAPHY](#D522101304) | 7.5 | 3+0+0 | ELECTIVE | TURKISH |
| 522103305 | [CLINICAL ELECTROPHYSIOLOGY](#D522101305) | 7.5 | 3+0+0 | ELECTIVE | TURKISH |
| 522103307 | [RECEPTORS AND DRUG-RECEPTOR RELATIONSHIP](#DERS522103307) | 5.0 | 2+0+0 | ELECTIVE | TURKISH |
| 522103308 | [CALCIUM METABOLISM](#DERS522103308) | 5.0 | 2+0+0 | ELECTIVE | TURKISH |
| 522101600 | [SPECIALIZED FIELD COURSE](#Kimya_Lab) | 5 | 3+0+0 | COMPULSORY | TURKISH |
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| Spring Term |
| 522104301 | [NEUROBIOPHYSICS II](#D522102301) | 7.5 | 3+0+0 | COMPULSORY | TURKISH |
| 522106302 | [CHANNELS, RECEPTORS, CARRIERS](#D522102302) | 5.0 | 2+0+0 | ELECTIVE | TURKISH |
| 522104303 | [RADIATION BIOPHYSICS](#D522102303)  | 7.5 | 3+0+0 | ELECTIVE | TURKISH |
| 522104304 | [NEUROEXCITABILITY AND](#D522102304)[THRESHOLD VALUE MONITORING THRESHOLD VALUE MONITORING](#D522102304) | 7.5 | 2+0+0 | ELECTIVE | TURKISH |
| 522101600 | [SPECIALIZED FIELD COURSE](#Kimya_Lab) | 5 | 3+0+0 | COMPULSORY | TURKISH |
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| **COURSE CODE: 522103301** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: NEUROBIOPHYSICS I** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Course Category** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring ****Fall **X** | 3 | - | - | 3 | 7.5 | MANDATORY ELECTIVE**X** |
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| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Ways and Laws of Matter and Energy Transport through Cell Membranes, Passive and Active Behaviors of Membranes, Electrical Equivalent-Circuit Models of Membranes, Hodgkin-Huxley Model and Action Potential, Potentials in a Volume Conductor. |
| **COURSE AIMS** | Discuss the phenomena underlying bioelectricity and electrical conduction in a living organism and use this information to understand the functioning of the nervous system . |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | It is expected that the information presented will be comprehended at a level that will enable students to understand the second part of this course. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about the events underlying bio -electricity and electrical conduction in a living organism. |
| **TEXTBOOK** | **Esen F, Esen H:** BIOPHYSICS Neurobiophysics , Ankara Nobel Medical Bookstores, 2016. ISBN: 978-605-9215-10-7 |
| **OTHER REFERENCES** | **Hoppe W. , Lohmann W., Markl H., Ziegler H. ( eds ):** Biophysics , Springer-Verlag , Berlin, 1983.**Ruch TC, Patton HD** : Physiology and Biophysics (19th Edition), Saunders **Vasilescu V. , Margineanu DG** .: Introduction to Neurobiophysics . Abacus Press . 1982. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Structure of Biological Membranes and Molecular Models |
| **2** |  | Ways and laws of matter and energy transport across cell membranes |
| **3** |  | Resting Potential of Cells |
| **4** |  | Cell Membrane Transport Vehicles and Ionic Channels |
| **5** |  | Active Transport |
| **6** |  | Na -K pump models |
| **7** |  | Sources of Membrane Potential |
| **8** |  | MID-TERM EXAM |
| **9** |  | Electrical Equivalent Circuit Description of Cell Membranes |
| **10** |  | Passive Membrane Model and Local Voltage Wave Propagation |
| **11** |  | Active Behavior of Membranes |
| **12** |  | Action Potential Transmission in Nerve Fibers |
| **13** |  | Voltage Clamping Technique |
| **14** |  | Patch Clamping Technique |
| **15** |  | Propagation of electrical signals in excitable membranes, Hodgkin-Huxley Equation |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |

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| **COURSE CODE:** **522103302** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: MATHEMATICAL MODELS IN BIOPHYSICS** |
| **INSTRUCTOR GIVING THE COURSE** | **COURSE LANGUAGE****Turkish: X****English: ** | **Category of the Course** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring ****Fall **X** | 2 | - | - | 2 | 7.5 |  MANDATORY ELECTIVE ** X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **50** |
| Quiz |  |  |
| Homework |  |  |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **50** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Features of mathematical modeling of living systems. Basic mathematical models in biophysics. Rhythms in biological systems . Spatiotemporal self-organization of biological systems. Physical and mathematical models of biomacromolecules . Modeling complex biological systems. |
| **COURSE AIMS** | To introduce mathematical modeling that aims to reveal the behavior of living systems. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | To provide the ability to apply the basic tools learned in creating mathematical models. |
| **LEARNING OUTCOMES OF THE COURSE**  |  |
| **TEXTBOOK** | **Riznichenko Galina Yur'evna :** Mathematical Models in Biophysics . biophysical Textbook online . www.biophysics.org. |
| **OTHER REFERENCES** |  **Frank C. Hoppensteadt , Charles S. Peskin .** Mathematics in medicine and the life sciences . Springer-Verlag New York 1992. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Entrance |
| **2** |  | Features of mathematical modeling of living systems. |
| **3** |  | Basic mathematical models in biophysics. Unconstrained growth. |
| **4** |  | Exponential growth. Autocatalysis . |
| **5** |  | Limited growth. Verhulst equation.Nutritional deficiency. |
| **6** |  | Monod and Michaelis-Menten models.Race. Sorting. |
| **7** |  | Lotka and Volterra classic models. |
| **8** |  | Interspecies interaction model.Enzyme catalysis model. |
| **9** |  | Rhythms in biological systems . Glycolysis . |
| **10** |  | Intracellular calcium rhythms . Cellular cycles. |
| **11** |  | Spatiotemporal self-organization of biological systems.Waves of vitality. |
| **12** |  | Autowaves and damping waves. |
| **13** |  | Belousov-Zhabotinskii (BZ) reaction. |
| **14** |  | Theory of nerve conduction. |
| **15** |  | Physical and mathematical models of biomacromolecules . |
| **16** |  | Modeling complex biological systems. |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  |  | **X** |
| LO 5 | learn how to use the experimental equipment effectively |  |  | **X** |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data |  |  | **X** |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Signature** | **History** |

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| **COURSE CODE: 522103303** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: BIOMECHANICS II** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Course Category** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring ****Fall **X** | 3 | - | - | 3 | 7.5 | MANDATORY ELECTIVE** X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Biomechanics of the circulatory system. Bernoulli's equation. Viscous flow. Poiseuille's law. Fluid properties of blood. Mechanical properties of blood vessels. The heart as a pump. Functions of respiratory muscles. Surface tension and alveolar mechanics. Mechanical factors in respiration. |
| **COURSE AIMS** | To teach the basic concepts and laws of biomechanics along with the functioning of various organ systems. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | It is expected that the student will understand the importance of the biomechanical properties of various organ systems and will be able to use what he/she has learned to understand the problems that may arise in these systems. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about the biomechanics of the circulatory system, the mechanical properties of the vessels and surface tension and alveolar mechanics. |
| **TEXTBOOK** | **Pehlivan F .:** Biophysics (2nd Edition), Hacettepe-Taş Bookstore, Ankara, 1997.**Esen F .:** Lecture Notes, ESOGÜTF Biophysics Department. |
| **OTHER REFERENCES** | **Çelebi G:** Biomedical Physics, (2nd Edition), Barış Publications, Fakülteler Bookstore, İzmir, (1995).**Fung YC .:** Biomechanics , Mechanical Living Properties​ Tissues , Springer-Verlag , 1984.**Hoppe W. , Lohmann W., Markl H., Ziegler H. ( eds ):** Biophysics , Springer-Verlag , Berlin, 1983.**Ruch TC, Patton HD** : Physiology and Biophysics (19th Edition), Saunders , 1966. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Biomechanics of the circulatory system. Hydrostatic factor in circulation |
| **2** |  | of hemodynamics : Continuity equation. Bernoulli equation. |
| **3** |  | Internal friction, viscous, flow and viscosity coefficientNewtonian and non- Newtonian fluids |
| **4** |  | Poiseuille 's law |
| **5** |  | Blood fluidity properties |
| **6** |  | Vasodilatation and the Law of Laplace |
| **7** |  | Mechanical properties of vessels |
| **8** |  | MID-TERM EXAM |
| **9** |  | The heart as a pump |
| **10** |  | Arterial pressure pulse and its distribution. Pressure gradient |
| **11** |  | Respiratory system and its function |
| **12** |  | Functions of respiratory muscles |
| **13** |  | Surface tension and alveolar mechanics, Mechanical factors in respiration |
| **14** |  | Lung and chest complement , respiratory resistance factor |
| **15** |  | Volume and pressure changes during respiration. Work of breathing. Gas exchange between the alveoli and the blood |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | X |
| LO 2 | ask scientific questions and form hypothesis |  |  | X |
| LO 3 | search and interpret scientific literature |  |  | X |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522103304** |  | **DEPARTMENT:** BIOPHYSICS |
| **COURSE NAME: ELECTROCARDIOGRAPHY** |
| **INSTRUCTOR GIVING THE COURSE**Prof. Dr. Necmi ATA | **COURSE LANGUAGE****Turkish: X****English:** | **Course Category** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
|  |  | **X** |  |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| SpringFall **X** | 3 | - | - | 3 | 7.5 | MANDATORY ELECTIVE**X** |

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| **Course Evaluation** |
| **MID-TERM EXAM** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **50** |
| Quiz |  |  |
| Homework |  |  |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **50** |

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| **Course Content** | Characteristics of cardiac muscle cells. Electrical activities of cardiac muscle cells. Cardiac action potentials. Cardiac ion channels. Conduction of cardiac action potentials. Components of electrocardiogram (ECG) and terminology. Cardiac dipoles . Einthoven's triangle and fundamentals of electrocardiography. Bipolar , unipolar ECG. Vectorcardiography . |
| **Purpose of the Course** | To teach the basic principles of ECG. |
| **CONTRIBUTION OF THE COURSE TO PROVIDING VOCATIONAL EDUCATION**  | Basic principles of ECG in assessing heart function should be able to use . |
| **LEARNING OUTCOMES OF THE COURSE**  |  |
| **Textbook** | **Pehlivan F .:** Biophysics (2nd Edition), Hacettepe-Taş Bookstore, Ankara, 1997.**Esen F .:** Lecture Notes, ESOGU Faculty of Medicine, Department of Biophysics. |
| **Resources** | **Çelebi G:** Biomedical Physics, (2nd Edition), Barış Publications, Fakülteler Bookstore, İzmir, (1995).**Ruch TC, Patton HD** : Physiology and Biophysics (19th Edition), Saunders , (1966).**Schmidt RF , Thews G .:** Human Physiology . Springer-Verlag New York (1997). |
| **NECESSARY TOOLS AND EQUIPMENT IN THE COURSE** |  |

 \* In ECTS ( European Credit Transfer System ) Conversion is made by considering an academic year as 60 credits.

\*\* Please mark (X) in the appropriate fields.

**WEEKLY PLAN OF THE COURSE**

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| **Week** | **Topics** |
| 1 | Characteristics of cardiac muscle cells. |
| 2 | Electrical activities of cardiac muscle cells. |
| 3 | Cardiac action potentials. |
| 4 | Cardiac ion channels. |
| 5 | Conduction of cardiac action potentials |
| 6 | Components of the electrocardiogram (ECG) and terminology. |
| 7 | Cardiac dipoles . |
| 8 | Einthoven triangle |
| 9 | electrocardiography . |
| 10 | Bipolar , unipolar ECG. Vectorcardiography |
| 11 | unipolar  |
| 12 | MIDTERM EXAM |
| 13 | ECG |
| 14 | unipolar ECG. Vectorcardiography |
| 15 | ECG and Vectorcardiography |
| 16 | Vectorcardiography |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  |  | **X** |
| LO 5 | learn how to use the experimental equipment effectively |  |  | **X** |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data |  |  | **X** |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course**Prof. Dr. Necmi ATA | **History** |

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| **COURSE CODE: 522103305** |  | **DEPARTMENT:** BIOPHYSICS |
| **COURSE NAME: CLINICAL ELECTROPHYSIOLOGY** |
| **INSTRUCTOR GIVING THE COURSE**Prof. Dr. O.Oğuz ERDİNÇ | **COURSE LANGUAGE****Turkish: X****English:** | **Course Category** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
|  |  | **X** |  |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| SpringFall x | 3 | - | - | 3 | 7.5 | MANDATORY ELECTIVE**X** |

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| **Course Evaluation** |
| **MID-TERM EXAM** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **50** |
| Quiz |  |  |
| Homework |  |  |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **50** |

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| **Course Content** | Electroencephalography (EEG), Electromyography (EMG), Electroneurography (ENG) and Evoked Potentials (EP) |
| **Purpose of the Course** | To explain and understand the changes in electrical activity that occur in excitable cells and their recording. |
| **CONTRIBUTION OF THE COURSE TO PROVIDING VOCATIONAL EDUCATION**  | recordings that occur by excitable cells . |
| **LEARNING OUTCOMES OF THE COURSE**  |  |
| **Textbook** | **Michael Aminoff :** Aminoff's Electrodiagnosis in Clinical Neurology .Saunders Publishing House  |
| **Resources** | **Peter W. Kaplan , Thien Nguyen :** Clinical Electrophysiology : A Handbook for Neurologists .​ Wiley-Blackwell Publications |
| **NECESSARY TOOLS AND EQUIPMENT IN THE COURSE** |  |

\* In ECTS ( European Credit Transfer System ) Conversion is made by considering an academic year as 60 credits.

\*\* Please mark (X) in the appropriate fields.

**WEEKLY PLAN OF THE COURSE**

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| **Week** | **Topics** |
| 1 | of Electroencephalography (EEG) |
| 2 | EEG recording and EEG waves |
| 3 | Sleep and EEG |
| 4 | Epilepsy and EEG |
| 5 | Sleep and Polysomnography (PSG) |
| 6 | of Electromyography (EMG) |
| 7 | EMG recording |
| 8 | Situations where EMG is used |
| 9 | of Electroneurography (ENG) |
| 10 | Getting ENG registration |
| 11 | Situations where ENG is used |
| 12 | MIDTERM EXAM |
| 13 | Evoked Potentials (EVP) |
| 14 | Auditory Evoked Potentials (AEVs) |
| 15 | Visual Evoked Potentials (VEP) |
| 16 | Somatosensory Evoked Potentials (SEP) |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  |  | **X** |
| LO 5 | learn how to use the experimental equipment effectively |  |  | **X** |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data |  |  | **X** |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course**Prof. Dr. O.Oğuz ERDİNÇ**Signature** | **History** |

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| **COURSE CODE: 522103306** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: EVOKED POTENTIALS AND DATA COLLECTION** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Category of the Course** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring ****Fall **X** | 2 | 2 | - | 3 | 7.5 | MANDATORY ELECTIVE**X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Biopotentials obtained by electrical, mechanical or chemical stimuli , bioelectric application tools, measurement and observation tools, amplification , operational amplifiers, analog filters, digital filters, signal sampling , A/D converters, noise removal. |
| **COURSE AIMS** | To recognize the methods and tools used for generating biological potentials through stimulation and observing/recording data, to learn their properties and to understand their use. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | As a result of the information provided, the student is expected to be able to understand and apply the methods used in a biophysical research study. |
| **LEARNING OUTCOMES OF THE COURSE**  | Evoked potentials, stimulation , signal sampling, and signal denoising. |
| **TEXTBOOK** | Pehlivan F .: Biophysics (8th Edition), Pelikan Bookstore, Ankara, 2015. |
| **OTHER REFERENCES** |  The Axon Guide, electrophysiology and biophysics laboratory techniques . Molecular Devices , LLC, Sunnyvale , California : Molecular Devices , February 2012. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | The concept and source of evoked potential |
| **2** |  | Characteristics and design of stimuli |
| **3** |  | Of in vivo and in vitro stimulation methods |
| **4** |  | Stimulation , stimulators |
| **5** |  | Bioelectric application tools |
| **6** |  | Stimulus isolation |
| **7** |  | Bioelectrical measurement and monitoring tools |
| **8** |  | MID-TERM EXAM |
| **9** |  | Amplification , amplifiers, operational amplifiers |
| **10** |  | Analog filters, digital filters |
| **11** |  | Signal sampling , sampling rate |
| **12** |  | sweep time, resampling |
| **13** |  | A/D converters, D/A converters |
| **14** |  | Optimization of biopotential transport vehicles |
| **15** |  | Noise cancellation |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522103307** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: RECEPTORS AND DRUG-RECEPTOR RELATIONSHIP** |
| **INSTRUCTOR GIVING THE COURSE****Prof. Dr. Bilgin KAYGISIZ** | **COURSE LANGUAGE****Turkish: X****English: ** | **Category of the Course** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring ****Fall **X** | 2 | - | - | 2 | 5 | MANDATORY ELECTIVE** X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework |  |  |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **60** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Receptor definition, molecular structures, locations in the cell, functions, classifications, post-receptor events, ligand binding properties of the receptor, selectivity, agonist - antagonist concept, receptor theory, drug design |
| **COURSE AIMS** | students with the concepts of the functioning and classification of receptors that bind drugs, neurotransmitters , hormones and other endogenous substances and mediate their effects. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | Once the student grasps the concept of receptors, it is aimed for the student to gain the ability to identify new research topics and establish hypotheses in areas such as the development of new drug molecules. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about ligand binding properties of the receptor , selectivity, agonist - antagonist concept, receptor theory and drug design. |
| **TEXTBOOK** | 1. Kayaalp Medical Pharmacology in Terms of Rational Treatment, Prof. Dr. S. Oğuz KAYAALP Editor, 12th Edition, 2009, Pelikan Publishing.2. Bertram G. Katzung , Basic and Clinical Pharmacology 14th edition,2018.3. Goodman and Gilman's The Pharmacological Basis of Therapeutics , 13th edition , 2018. |
| **OTHER REFERENCES** |   |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Receptor definition and molecular structure of receptors |
| **2** |  | Functions and classification of receptors |
| **3** |  | G protein-coupled receptors |
| **4** |  | G proteins and second messengers |
| **5** |  | Receptors associated with kinases |
| **6** |  | Nuclear receptors |
| **7** |  | Ligand -activated ion channel type receptors |
| **8** |  | MID-TERM EXAM |
| **9** |  | Receptor theories |
| **10** |  | Agonism -Antagonism |
| **11** |  | Receptor desensitization and regulation of receptors |
| **12** |  | Diseases resulting from receptor and pathway disorders |
| **13** |  | Mechanisms of action and molecular mechanisms of drugs |
| **14** |  | Drug design |
| **15** |  | Interactions between drugs |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  | **X** |  |
| LO 2 | ask scientific questions and form hypothesis |  | **X** |  |
| LO 3 | search and interpret scientific literature |  | **X** |  |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  | **X** |  |
| LO 7 | identify, formulate, and solve medical problems |  | **X** |  |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences | **X** |  |  |
| LO 10 | use effective written and oral communication/presentation skills |  |  |  |
| LO 11 | get an understanding of professional and ethical responsibility |  | **X** |  |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  | **X** |  |
| LO 13 | other (get an understanding of basic concepts of medical education) |  | **X** |  |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) | **X** |  |  |

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| **Instructor of the Course****Prof. Dr. Bilgin KAYGISIZ****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522103308** |  | **DEPARTMENT: Medical Biochemistry** |
| **COURSE NAME: CALCIUM METABOLISM** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Evin KOCATÜRK** | **COURSE LANGUAGE****Turkish: X****English: ** | **Course Category** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring ****Fall **X** | 2 | - | - | 2 | 5 | MANDATORY ELECTIVE** X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework |  |  |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **60** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Calcium metabolism and related metabolic pathways |
| **COURSE AIMS** | calcium metabolism and related metabolic pathways |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | To learn calcium metabolism, understand the related metabolic pathways and their relationship with diseases. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about calcium metabolism and related metabolic pathways, the relationship between calcium and enzymatic catalysis , and the effects of calcium on signal transduction. |
| **TEXTBOOK** | Peter A. Mayes , Robert K. Murray Daryl K. Granner , (2004). Harper's Biochemistry . 25th Edition. United States of America  |
| **OTHER REFERENCES** | -Lehninger , Nelson, D.L. & Cox , M.M. (2000). Principles of Biochemistry . Third Edition- Figen Gürdöl , Medical Biochemistry, Nobel Medical Bookstore, 2015. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Calcium biochemistry |
| **2** |  | Calcium homeostasis |
| **3** |  | Intracellular calcium and its functions |
| **4** |  | Regulation of plasma calcium levels |
| **5** |  | Factors affecting plasma calcium levels |
| **6** |  | Hormones involved in the regulation of calcium metabolism |
| **7** |  | Calcium metabolism disorders |
| **8** |  | MID-TERM EXAM |
| **9** |  | Bone mineralization |
| **10** |  | Calcium and Neural Transmission |
| **11** |  | Calcium and Muscle Contraction |
| **12** |  | Calcium and Cellular Secretion |
| **13** |  | Calcium and signal transduction |
| **14** |  | Calcium and Enzymatic catalysis |
| **15** |  | Calcium and the Coagulation System |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  | **X** |  |
| LO 3 | search and interpret scientific literature |  | **X** |  |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively |  | **X** |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data |  | **X** |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  | **X** |  |
| LO 11 | get an understanding of professional and ethical responsibility |  | **X** |  |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  | **X** |  |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  | **X** |  |

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| **Instructor of the Course****Assoc. Prof. Dr. Evin KOCATÜRK****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522104301** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: NEUROBIOPHYSICS II** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Category of the Course** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring **X**Autumn **** | 3 | - | - | 3 | 8 | MANDATORY ELECTIVE**X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Intercellular Communication ( Synaptic Transmission), Cells Specialized in Sensory Perception (Biological Sensors ), Psychophysical Laws, Sensory Systems in Terms of Information Theory, Biological Control. |
| **COURSE AIMS** | the neurobiophysics program as a whole is to understand the functioning of the nervous system. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | A student participating in this program should have a very good/accurate understanding of the current knowledge and future developments in this field. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about synaptic transmission, sensory systems and information theory. |
| **TEXTBOOK** | **Esen F, Esen H:** BIOPHYSICS Neurobiophysics , Ankara Nobel Medical Bookstores, 2016. ISBN: 978-605-9215-10-7 |
| **OTHER REFERENCES** | **Hoppe W. , Lohmann W., Markl H., Ziegler H. ( eds ):** Biophysics , Springer-Verlag , Berlin, 1983.**Ruch TC, Patton HD** : Physiology and Biophysics (19th Edition), Saunders **Vasilescu V. , Margineanu DG** .: Introduction to Neurobiophysics . Abacus Press . 1982. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Intercellular Communication ( Synaptic Transmission) |
| **2** |  | Sequential events in chemical synaptic transmission |
| **3** |  | Quantum Release of Chemical Mediator |
| **4** |  | Post- synaptic Potentials |
| **5** |  | Synaptic Events with Electrical Equivalent Circuits |
| **6** |  | Synaptic Total |
| **7** |  | Electrical Synaptic Transmission |
| **8** |  | MID-TERM EXAM |
| **9** |  | Receptor Structures |
| **10** |  | Types of Stimuli and Cells Specialized in Detecting Them |
| **11** |  | Biopotentials of Sensor Cells |
| **12** |  | Psychophysical Laws in Sensory Perception |
| **13** |  | Information Theory |
| **14** |  | Sensory Systems from an Information Theory Perspective |
| **15** |  | Basic Principles of Biological Control, Various Examples of Biological Control |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522106302** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: CHANNELS, RECEPTORS AND CARRIERS** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Course Category** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring **X**Autumn **** | 2 | - | - | 2 | 5 | MANDATORY ELECTIVE** X** |
|  |
| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Diffusion. Electrochemical potential. Gate currents. Lipid bilayer. Structure of membrane proteins in the cell membrane. Particle flux across the membrane, one-way flux.Voltage clamping. Patch clamping technique. |
| **COURSE AIMS** | The aim of this course as a whole is to understand the functioning of channels, receptors and transporters found in the cell membrane. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | A student participating in this program should have a very good/accurate understanding of the current knowledge and future developments in this field. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about the functioning of ion channels, receptors and transporters in the cell membrane. |
| **TEXTBOOK** | **Esen F, Esen H:** BIOPHYSICS Neurobiophysics , Ankara Nobel Medical Bookstores, 2016. ISBN: 978-605-9215-10-7 |
| **OTHER REFERENCES** | **Hoppe W. , Lohmann W., Markl H., Ziegler H. ( eds ):** Biophysics , Springer-Verlag , Berlin, 1983.**Ruch TC, Patton HD** : Physiology and Biophysics (19th Edition), Saunders **Vasilescu V. , Margineanu DG** .: Introduction to Neurobiophysics . Abacus Press . 1982. |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Introduction: Structure of cell membranes. |
| **2** |  | Diffusion. Electrochemical potential. |
| **3** |  | Action potential and ionic currents. Voltage clamp technique |
| **4** |  | Membrane conductance |
| **5** |  | Sodium And potassium conductivity |
| **6** |  | Patch clamping technique |
| **7** |  | Sodium channels |
| **8** |  | MID-TERM EXAM |
| **9** |  | Potassium channels |
| **10** |  | Calcium channels. Chlorine channels. |
| **11** |  | Chemical Synaptic Transmission |
| **12** |  | Neurotransmitter -Receptor Interaction |
| **13** |  | Ligand Gated Ion Channels |
| **14** |  | G-Protein -Coupled Receptors |
| **15** |  | Basic Structure of G-Protein -Coupled Receptors |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522104303** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: RADIATION BIOPHYSICS** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Category of the Course** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring **X**Autumn **** | 3 | - | - | 3 | 7.5 | MANDATORY ELECTIVE** X** |
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| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Fundamental Concepts of Radiation Biophysics, Ionization , Biological Effects of Ionizing Radiation, International Standards and Safety Precautions, Fundamental Principles of Imaging Methods. |
| **COURSE AIMS** | To teach the basic principles of various methods used for diagnosis/treatment purposes in medicine, and to present the biological effects of the energies applied to the human body and the precautions that can be taken with these methods. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | It is expected that the concept of imaging for different methods is understood, the importance of safe energy use for this purpose, and the biological effects of various energies. |
| **LEARNING OUTCOMES OF THE COURSE**  | To have knowledge about the Basic Concepts of Radiation Biophysics, Ionization , Biological Effects of Ionizing Radiation, International Standards and Safety Precautions, Basic Principles of Imaging Methods. |
| **TEXTBOOK** | **Esen H, Esen F:** BIOPHYSICAL Methods, Biological Effects, PrecautionsAnkara Nobel Medical Bookstores, 2017, ISBN: 978-605-9215-38-1 |
| **OTHER REFERENCES** | **Hoppe W. , Lohmann W., Markl H., Ziegler H. ( eds ):** Biophysics , Springer-Verlag , Berlin, 1983.**Damask AC** . Medical Physics , Volume I, Academic Press , (1978)**Damask AC, Swenberg CE .** , Medical Physics , Volume III, Academic Press , (1984). |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Fundamental Concepts of Radiation Biophysics |
| **2** |  | Ionizing Radiation, Radioactive Decay |
| **3** |  | X-rays |
| **4** |  | Ionizing Radiation with Matter |
| **5** |  | Detection of Radiation |
| **6** |  | Radiant Dose, Dose Rate, Equivalent Dose |
| **7** |  | Describe and explain the effect of radiation |
| **8** |  | MID-TERM EXAM |
| **9** |  | Ionizing Radiation, Protection from Ionizing Radiation |
| **10** |  | Radiography, Fulloroscopy |
| **11** |  | Computed Tomography (CT) |
| **12** |  | Radioisotope Techniques |
| **13** |  | Gamma Camera, Single Photon Emission Tomography (SPECT) |
| **14** |  | Positron Emission Tomography (PET) |
| **15** |  | Magnetic Resonance Imaging (MRI) |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |

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| **COURSE CODE: 522104304** |  | **DEPARTMENT: BIOPHYSICS** |
| **COURSE NAME: NEUROEXCITABILITY AND THRESHOLD MONITORING** |
| **INSTRUCTOR GIVING THE COURSE****Assoc. Prof. Dr. Seckin TUNCER** | **COURSE LANGUAGE****Turkish: X****English: ** | **Category of the Course** |
| Technical | Medical | Other ( …… ) |
|  |  |  | **X** |  |

**COURSE LEVEL**

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| **SCIENTIFIC PREPARATION** | **DEGREE** | **DOCTORATE** | **SPECIALIZED FIELD COURSE** |
| **** |  | **X** | **** |

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| **SEMESTER** | **WEEKLY CLASS HOURS** | **YOUR COURSE** |
| **Theoretical** | **APPLICATION** | **Lab** | **Credit** | **ECTS** | **TYPE** |
| Spring **X**Autumn **** | 2 | 2 | - | 3 | 7.5 | MANDATORY ELECTIVE** X** |
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| **EVALUATION CRITERIA** |
| **SEMESTER ACTIVITIES** | **Type of activity** | **Number** | **Percentage (%)** |
| Midterm Exam | **1** | **40** |
| Quiz |  |  |
| Homework | **1** | **20** |
| Project |  |  |
| Oral examination |  |  |
| Other ( ……… ) |  |  |
| **Final Exam** | **40** |
| **PREREQUISITE(S)** |   |
| **SHORT COURSE CONTENT** | Neuronal structural features affecting excitability , rheobase and chronaxy, placement of stimulating electrodes in threshold monitoring, threshold monitoring protocols (stimulus-response relationship, stimulus intensity-duration relationship, threshold load-stimulus duration relationship, recovery cycle, threshold electrotonus curve, current-threshold relationship). |
| **COURSE AIMS** | Neuronal To learn the factors that determine and change excitability and to understand the basic principles of the methods used for its measurement. |
| **COURSE CONTRBUTION TO THE PROFESSIONAL EDUCATION OBJECTIVES** | Neuronal It is expected that the candidate will have knowledge of the basic concepts related to excitability and will be able to apply the basic principles of measurement methods. |
| **LEARNING OUTCOMES OF THE COURSE**  | Neuronal Learning the concept of excitability , learning the principles and areas of use of the threshold value monitoring method. |
| **TEXTBOOK** | -Hugh​ Bostock , Werner Z'Graggen , Jordi Serra, Arun Krishnan , Susan E. Tomlinson , Veronica Tan, Delphine Boeiro and Susanna Park, Nerve Excitability Workshop Notes , 2011, Chicley Hall , UK.- Esen H, Esen F: BIOPHYSICAL Methods, Biological Effects, Precautions, Ankara Nobel Medical Bookstores, 2017. ISBN: 978-605-9215-38-1 |
| **OTHER REFERENCES** | Lecar H. Physical Mechanisms of Nerve Excitability . In : Perlmutter A. , Scott L. F. ( eds ) The Significance of Nonlinearity in the Natural Sciences . Studies in the Natural Sciences (A Series from the Center for Theoretical Studies ), vol 13, 1977, Springer , Boston, MA |
| **TOOLS AND EQUIPMENTS REQUIRED**  |  |

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|  | **WEEKLY PLAN OF THE COURSE** |
| **WEEK** | **HISTORY** | **TOPICS COVERED** |
| **1** |  | Overview of the structure of the neuron |
| **2** |  | Functional effects of physical properties of the axon |
| **3** |  | The concept and history of neuroexcitability |
| **4** |  | Effect of structural properties on neuroexcitability |
| **5** |  | Effect of intracellular and extracellular components on neuroexcitability |
| **6** |  | Weiss's law, rheobase and chronaxy concepts |
| **7** |  | Threshold value monitoring method |
| **8** |  | MID-TERM EXAM |
| **9** |  | Stimulus intensity-response relationship |
| **10** |  | Stimulus intensity-duration relationship |
| **11** |  | Threshold load-stimulus duration relationship |
| **12** |  | Recovery cycle ( refractory periods and lower-upper excitability points) |
| **13** |  | Threshold electrotonus curves |
| **14** |  | Current-threshold relationship |
| **15** |  | Electrode placements, errors and prevention/remediation methods in the threshold value monitoring method |
| **16** |  | END OF SEMESTER EXAM |

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| **CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES** | **Contribution Level** |
| **NO** | **LESSON OUTCOMES** | **1****Little** | **2****Middle** | **3****High** |
| LO 1 | gather as well as apply knowledge of health sciences |  |  | **X** |
| LO 2 | ask scientific questions and form hypothesis |  |  | **X** |
| LO 3 | search and interpret scientific literature |  |  | **X** |
| LO 4 | design and conduct experiments as well as analyze and interpret the data |  | **X** |  |
| LO 5 | learn how to use the experimental equipment effectively | **X** |  |  |
| LO 6 | function on multi-disciplinary teams |  |  | **X** |
| LO 7 | identify, formulate, and solve medical problems |  |  | **X** |
| LO 8 | use computer effectively both in conducting the experiments and analyzing the data | **X** |  |  |
| LO 9 | understand the impact of experimental solutions on national and international sciences |  |  | **X** |
| LO 10 | use effective written and oral communication/presentation skills |  |  | **X** |
| LO 11 | get an understanding of professional and ethical responsibility |  |  | **X** |
| LO 12 | get a recognition of the need for, and an ability to engage in lifelong learning |  |  | **X** |
| LO 13 | other (get an understanding of basic concepts of medical education) |  |  | **X** |
| LO 14 | other (get an understanding of approaching to ethical problems with taking basic concepts to center) |  |  | **X** |

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| **Instructor of the Course****Assoc. Prof. Dr. Seckin TUNCER****Signature** | **History**25.03.2025 |