**ACADEMIC DISCIPLINE OVERVIEW**

1. **Program data**

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| 1.1. Higher education institution | Grigore T. Popa University of Medicine and Pharmacy Iasi |
| 1.2. Faculty | Medical Bioengineering |
| 1.3. Department | Biomedical Sciences |
| 1.4. Field of study | Health |
| 1.5. The cycle of studies | Bachelor |
| 1.6. Study program / qualification | Balneo-physiokinetotherapy and rehabilitation – english language / Physiokinetotherapist |

**2. Discipline data**

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| 2.1. Name of the discipline / Code | | | | **Electrotherapy. Biomedical Instrumentation for Rehabilitation Procedures** | | **RE1208** |
| 2.2. Teaching staff in charge with lectures | | | | **Lecturer Iustina Condurache, PhD**  **Professor Radu Ciorap, PhD** | | |
| 2.3. Teaching staff in charge with practical activities | | | | **Lecturer Iustina Condurache, PhD**  **Lecturer Catalina Luca, PhD** | | |
| 2.4. Year of study | **II** | 2.5. Semester | **1+2** | 2.6. The type of assessment | **Colloquium, E1, E2** | |
| 2.7. Discipline type | | **Mandatory** | | **Specialty discipline** | | |

**3. Estimated total time (hours/semester of didactic activity)**

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| 3.1. Number of hours / week: | | 3.2. Courses number of hours / week | | 3.3. Seminars / practical classes  number of hours / week | | | |
| Semester 1 | **4** | **2** | | **2** | | | |
| Semester 2 | **2** | **1** | | **1** | | | |
| 3.4. Total number of learning hours: | **84** | 3.5. Of which: Courses | **42** | 3.6. Of which: Seminars / practical classes: | | | **42** |
| 3.7. Distribution of individual study time: | | | | | Hours sem. 1 | Hours sem. 2 | |
| Study time using course book materials, bibliography and hand notes | | | | | 12 | 12 | |
| Supplementary documentation in the library, using specialised platforms via internet and by field work | | | | | 12 | 5 | |
| Preparation time for seminars / practical classes, study themes, reviews, portfolio and essays | | | | | 12 | 5 | |
| Tutorship | | | | | 2 | 2 | |
| Examinations | | | | | 2 | 2 | |
| Other activities | | | | | 8 |  | |
| Total hours of individual study (*without examinations*) | | | | | **44** | **22** | |
| 3.8. Total hours per semester | | | | | **100** | **50** | |
| 3.9. Number of credits | | | | | **4** | **2** | |

**4. Preconditions (where applicable)**

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| 4.1. of curriculum | Anatomy, Physiology, Motor and somato-functional measurement and assessment |
| 4.2. of competences | Knowledge of the techniques for exploring/evaluating the functionality of the human body. |

5. **Conditions (where applicable)**

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| 5.1. for lectures | Video logistics support. |
| 5.2. for seminars / practical classes | Treatment Base, 4th floor, Faculty of Medical Bioengineering.  Electrotherapy devices.  Students will wear protective equipment (Grob, Medical Clogs). |

**6. Specific competences acquired**

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| **Professional competencies** | **C4.1** | Knowledge of electrotherapy techniques, application parameters, indications, contraindications, the way the equipment that supplies the electric current and derived forms of energy work. |
| **C4.2** | Using basic knowledge to explain and interpret electrotherapy procedures. |
| **C4.3** | The application of electrotherapy, phototherapy, magnetotherapy, ultasonotherapy procedures, adapted to the pathology and the treated region. |
| **C4.4** | The use of appropriate parameters in all forms of electrotherapy, appreciating the analgesic, decontracting effects or the intensity of muscle contraction depending on the applied procedure. |
| **C4.5** | Implementation of different strategies for the development of new electrotherapy protocols. |
| **C5.5** | Monitoring, development and validation of new functional assessment scores. |

7**.** **Objectives of the study discipline (according to the grid of specific competences acquired)**

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| 7.1. General objective | Knowledge of the mode of action, effects and application techniques of various electrotherapy procedures. Providing those basic knowledge and skills with the help of which the student can use the biomedical instrumentation for recovery in the best conditions and maximum performance. |
| 7.2. Specific objectives | Knowledge of the techniques and application methods of electrotherapy in various post-traumatic rheumatic, neurological conditions. Acquiring general notions regarding the measurement process, parameters and normal measurement values of the organism viewed as a biosystem. Acquiring general notions regarding medical instrumentation specific to medical recovery in various ailments using various physical phenomena. |

**8. Contents**

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| **8.1. Lectures** | | **Teaching methods** | **Observations** |
| 1 | Electrotherapy. Introduction. Generalities. | Power point presentation | 2 hours |
| 2 | Physical phenomena used in physiotherapy. | Power point presentation | 2 hours |
| 3 | Direct current. Galvanic current. | Power point presentation | 2 hours |
| 4 | Alternating current. Low frequency currents. | Power point presentation | 2 hours |
| 5 | Alternating current. Medium frequency current. | Power point presentation | 2 hours |
| 6 | Alternating current. High frequency current. | Power point presentation | 2 hours |
| 7 | Ultrasound. | Power point presentation | 2 hours |
| 8 | Laser therapy. | Power point presentation | 2 hours |
| 9 | Low frequency magnetic fields. | Power point presentation | 2 hours |
| 10 | Phototherapy. Ultraviolet radiation. Infrared radiation. | Power point presentation | 2 hours |
| 11 | Traction therapy. dispozitive. | Power point presentation | 2 hours |
| 12 | Tecar therapy. Shock wave. | Power point presentation | 2 hours |
| 13 | Lokomat. Gloreha. | Power point presentation | 2 hours |
| 14 | Medical aesthetics. dispozitive. | Power point presentation | 2 hours |
|  | **Semester 2** |  |  |
| 1 | Fundamentals of the electric and magnetic field. Physical quantities, methods of measurement, units of measure, measurement errors. Patient and user safety. Elements of electrical safety. | Powerpoint presentation | 2 hours |
| 2 | Biosignals: definition and classification. Structure of the measurement chain for biomedical parameters. Classification of biomedical instrumentation. The regulation of medical devices used in the rehabilitation practice | Powerpoint presentation | 2 hours |
| 3 | Biomedical instrumentation using low-frequency currents for medical recovery (EMS, TENS, Diadynamic). Functional principle of the devices, technical characteristics, and elements of safe use. | Powerpoint presentation | 2 hours |
| 4 | Biomedical instrumentation using medium, high-frequency currents and microwaves for medical recovery. Functional principle of the devices, technical characteristics, and elements of safe use. | Powerpoint presentation | 2 hours |
| 5 | Biomedical instrumentation using ultrasound and magnetic field for medical recovery. Functional principle of the devices, technical characteristics, and elements of safe use. | Powerpoint presentation | 2 hours |
| 6 | Biomedical instrumentation for the rehabilitation of gait and balance disorders | Powerpoint presentation | 2 hours |
| 7 | Biomedical instrumentation for functional electrical stimulation and rehabilitation robotics | Powerpoint presentation | 2 hours |

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| **8.2. Practical activities - practical class** | | **Teaching methods** | **Observations** |
| 1 | Electrotherapy. General presentation. | Practical application | 2 hours |
| 2 | Galvanic current. Application techniques. | Practical application | 2 hours |
| 3 | Low frequency currents. Application techniques. TENS | Practical application | 2 hours |
| 4 | Low frequency currents. Application techniques. Trabert | Practical application | 2 hours |
| 5 | Low frequency currents. Application techniques. CDD | Practical application | 2 hours |
| 6 | Low frequency currents. Application techniques. CDD | Practical application | 2 hours |
| 7 | Medium frequency current. High frequency current. Application techniques. | Practical application | 2 hours |
| 8 | Ultrasound. Application techniques. | Practical application | 2 hours |
| 9 | Laser therapy. Application techniques. | Practical application | 2 hours |
| 10 | Low frequency magnetic fields. Application techniques. | Practical application | 2 hours |
| 11 | Phototherapy. Ultraviolet radiation. Infrared radiation. Application techniques. | Practical application | 2 hours |
| 12 | Traction therapy. dispozitive. Application techniques. | Practical application | 2 hours |
| 13 | Tecar therapy. Shock wave. Application techniques. | Practical application | 2 hours |
| 14 | Lokomat. Gloreha. Application techniques. | Practical application | 2 hours |
|  | **Semester 2** |  |  |
| 1 | Fundamentals of the electric and magnetic field. Visualization of different types of currents and voltages. Measuring the amplitude, time period and frequency of alternating voltages. Determine the value of current flowing through different impedances. | Practical application | 2 hours |
| 2 | Structure of the measurement chain for biomedical parameters. Means of biosignal capture. Electrodes and transducers for biosignal capture. Amplification and primary processing of biosignals. Means of data visualization. | Practical application | 2 hours |
| 3 | Measurement of bioelectrical and biomechanical parameters. Recording of bioelectrical signals ECG, EMG; determination of muscle strength | Practical application | 2 hours |
| 4 | Biomedical instrumentation using low and medium currents for medical recovery. Visualization of waveforms simulating different patient impedances | Practical application | 2 hours |
| 5 | Biomedical instrumentation using Virtual Reality for neuromuscular rehabilitation | Practical application | 2 hours |
| 6 | Biomedical instrumentation for evaluation and rehabilitation of balance disorders | Practical application | 2 hours |
| 7 | Biomedical instrumentation using FES for gait rehabilitation | Practical application | 2 hours |

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| **8.3. Bibliography:** |
| ***Mandatory:***   1. Courses and practical works support that is provided on the e-learning platform. 2. Watson T., Nussbaum E. Electrophysical Agents. 13th Edition. Paperback, 2020. 3. Fox J.H., Sharp T.N. Practical Electrotherapy: A Guide to Safe Application 1st Edition. Churchill Livingstone, 2007. 4. Ciorap R., Andritoi D., Biomedical Instrumentation for Electrotherapy, 2023 5. Punit Prakash, Govindarajan Srimathveeravalli, Principles and Technologies for Electromagnetic Energy Based Therapies, Academic Press, 2022 6. David X. Cifu (Ed.), Braddom's Physical Medicine and Rehabilitation (Sixth Edition), Elsevier, 2021 7. Khandpur R. S., Compendium of Biomedical Instrumentation, Ed. John Wiley & Sons Ltd, 2020 8. Christe, B. Introduction to Biomedical Instrumentation: The Technology of Patient Care (2nd Edition), Cambridge University Press, 2017. |

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| ***Elective:*** |
| 1. Colombo R., Sanguineti V. (Eds.), Rehabilitation Robotics-Technology and Application, Elsevier-Academic Press, 2018 2. George D. O’Clock, Electrotherapeutic Devices: Principles, Design, and Applications, Artech House Publishers, 2007 |

**9. *Correlation of the discipline contents with the expectations of the epistemic community, professional associations, and representative employers from the afferent program field***

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| Knowledge and abilities are established as didactic objectives and specified as such in the analytic programs that are revised yearly. After their analysis by the study discipline staff, these are discussed and approved in the Curricular Committee, towards curricular harmonization among the various study disciplines. Along this entire process systematic evaluation is performed, directly if possible, regarding the correspondence of the contents to the expectations of the academic community and of the representatives of the social community, professional associations, and employers. |

**10. Evaluation**

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| Type of activity | Assessment criteria | Evaluation methods | Contribution to the final grade |
| Lectures | Acquiring theoretical notions and presented in the course | Written exam.  MCQ Examination | 80 % |
| Practical activities | Activities carried out in laboratory and conducted quality essays. | Colloquium practical activity | Admitted/ Rejected |
| Individual study | Preparation time for seminars / practical classes, study themes, reviews, portfolio and essays.  Study time using coursebook materials, bibliography and hand notes, documentation in the library, using specialised platforms via internet and by field work. | Tests during the semester | 20 % |
| Minimal performance standard:   * Knowledge, understanding and correct use of specific terminology. * The student's ability to select a certain instrumentation system, appropriate to the specific problems of the biomedical recovery practice. | | | |

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| Date | Holder of course / signature, | | | Holder of practical activities / signature, |
| 12.09.2024 | Lecturer Iustina Condurache, PhD  Professor Radu Ciorap, PhD | | | Lecturer Iustina Condurache, PhD |
|  |  | | | Lecturer Catalina Luca, PhD |
| Date of approval in the Department Council/Teaching Council, | | | | |
| 19.09.2024 | |  | Department director / signature, | |
|  | |  | Associate Professor Daniela-Viorelia Matei, MD, PhD | |