**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 | | | | **Biomechanics** | | **RE1112** |
| 2.2. Teaching staff in charge with lectures | | | | **Lecturer Sînziana Anca Butnaru-Moldoveanu, PhD** | | |
| 2.3. Teaching staff in charge with practical activities | | | | **Lecturer Sînziana Anca Butnaru-Moldoveanu, PhD** | | |
| 2.4. Year of study | **I** | 2.5. Semester | **2** | 2.6. The type of assessment | **Exam, E2** | |
| 2.7. Discipline type | | **Mandatory** | | **Fundamental 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 |  |  | |  | | | |
| Semester 2 | **4** | **2** | | **2** | | | |
| 3.4. Total number of learning hours: | **56** | 3.5. Of which: Courses | **28** | 3.6. Of which: Seminars / practical classes: | | | **28** |
| 3.7. Distribution of individual study time: | | | | | Hours sem. 1 | Hours sem. 2 | |
| Study time using course book materials, bibliography and hand notes | | | | |  | 15 | |
| Supplementary documentation in the library, using specialized platforms via internet and by fieldwork | | | | |  | 12 | |
| Preparation time for seminars / practical classes, study themes, reviews, portfolio and essays | | | | |  | 12 | |
| Tutorship | | | | |  | 4 | |
| Examinations | | | | |  | 8 | |
| Other activities | | | | |  | 5 | |
| Total hours of individual study (*without examinations*) | | | | |  | **44** | |
| 3.8. Total hours per semester | | | | |  | **100** | |
| 3.9. Number of credits | | | | |  | **4** | |

**4. Preconditions (where applicable)**

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| 4.1. of curriculum | Anatomy, Physiology |
| 4.2. of competences | Knowledge of appropriate parameters in techniques used to increase joint mobility, muscle strength, coordination, and balance. Knowledge of the concepts, theories and fundamental notions of physiological and pathological mechanisms of the human body |

5. **Conditions (where applicable)**

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| 5.1. for lectures | Video logistical support |
| 5.2. for seminars / practical classes | Anatomical models of the joints of the human body  Equipment for measurement of biomechanical parameters |

**6. Specific competences acquired**

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| **Professional competencies** | **C 5.1** | Description of concepts, theories and fundamental notions of physiological and pathological mechanisms of the human body, identification of symptoms and clinical signs, identification of kinetotherapy methods and techniques.  Description of joint and muscle balance techniques, functional assessment scores and assessment of the quality of life of patients with disabilities |
| **C 6.1** | Identifying the principles of making and applying orthoses, prostheses and other medical devices. |
| **C 6.2** | Explaining the appropriateness of choosing the type of orthosis, prosthesis or other medical devices, as well as identifying occupational therapy techniques adapted to the dysfunction |

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

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| 7.1. General objective | - Familiarizing students with specific biomechanical concepts of the human body |
| 7.2. Specific objectives | - Knowledge of the biomechanical phenomena that occurs in the locomotor system |

**8. Contents**

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| **8.1. Lectures** | | **Teaching methods** | **Observations** |
| 1 | Muscle biomechanics | Interactive lecture, Discussions, Explanations. | 2 hours |
| 2 | Hip biomechanics | 2 hours |
| 3 | Knee biomechanics | 2 hours |
| 4 | Ankle biomechanics, foot biomechanics | 2 hours |
| 5 | Gait biomechanics | 2 hours |
| 6 | Spine biomechanics | 2 hours |
| 7 | Intervertebral disc biomechanics | 2 hours |
| 8 | Shoulder biomechanics | 2 hours |
| 9 | Elbow and forearm biomechanics | 2 hours |
| 10 | Wrist and hand biomechanics | 2 hours |
| 11 | Bone biomechanics | 2 hours |
| 12 | Tendon and ligament biomechanics | 2 hours |
| 13 | Cartilage biomechanics | 2 hours |
| 14 | Biotribology | 2 hours |

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| **8.2. Practical activities - practical class** | | **Teaching methods** | **Observations** |
| 1 | Introduction to Biomechanics (force, work, anthropometric parameters, joint movements) | Identification and analysis of kinetic parameters | 2 hours |
| 2 | Levers, joint mobility | Lever types, identification of lever type at various levels of the locomotor system | 2 hours |
| 3 | Biomechanics of locomotor couples | Identification of muscle force couples, observations, conclusions | 2 hours |
| 4 | Active-passive movements and kinetic parameters | Active and passive tensions in muscles, concentric and eccentric muscle action | 2 hours |
| 5 | Assessment of quality and quantity of movement. Muscle tests. | Work preparation, muscle-tendon assembly functioning, observations, conclusions | 2 hours |
| 6 | Biomechanical principles of the hip joint. Normal hip, pathological hip. | Work preparation, joint model, observations, conclusions | 2 hours |
| 7 | Biomechanical principles of the knee joint. Normal knee, pathological knee. | Work preparation, joint model, observations, conclusions | 2 hours |
| 8 | Biomechanical principles of the ankle joint. Normal ankle, pathological ankle. | Work preparation, joint model, observations, conclusions | 2 hours |
| 9 | Biomechanical principles of the leg joints. Normal foot, pathological foot. | Work preparation, joint model, observations, conclusions | 2 hours |
| 10 | Biomechanical principles of the spine. Normal and pathological spine. | Work preparation, joint model, observations, conclusions | 2 hours |
| 11 | Biomechanical principles of walking. Static and dynamic plantar pressure analysis. | Work preparation, postural models, observations, conclusions |  |
| 12 | Biomechanical principles of the shoulder joint. Normal shoulder, pathological shoulder. | Work preparation, joint model, observations, conclusions | 2 hours |
| 13 | Biomechanical principles applied to the forearm. Normal forearm, pathological forearm | Work preparation, joint model, observations, conclusions | 2 hours |
| 14 | Elements of functional biomechanics | Work preparation, joint model, observations, conclusions | 2 hours |

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| **8.3. Bibliography:** |
| ***Mandatory:*** |
| 1. Course notes, e-Learning platform;  2. Munteanu Fl. Botez. P.Biomecanica aparatului locomotor (vol I), Editura Venus, 2006 ISBN 973-756-023-X;  3. Susan Hall –Basic Biomechanics – 8th Edition, McGraw Hill, 2019;  4. Margareta Nordin; Victor H. Frankel – Basic Biomechanics of the Musculoskeletal System,– Lippincott Williams & Wilkins, 2012; |
| 5. Donald A. Neumann – Kinesiology of the musculoskeletal system: Foundations for Rehabilitation 3rd Edition- Elsevier, 2016;  6. James Watkins - Fundamental Biomechanics of Sport and Exercise - Routledge, Taylor & Francis Group, LONDON AND NEW YORK, 2019;  7. Ronald L. Huston - Fundamentals of Biomechanics - 2018 by CRC Press;  8. Schmitt, K.-U., Niederer, P.F., Cronin, D.S., Muser, M.H., Walz, F. - Trauma Biomechanics – Springer 2019; |

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| ***Elective:*** |
| 1. Jim Richards – Clinical Biomechanics – Elsevier, 2018; |
| 2. Hamil J., Knutzen K.M., Derrick T.R.- Biomechanical basis of human movement 5th Edition – Wolters Kluwer, 2021; |

**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.  Individual study 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:   * Knowing the biomechanical behavior of tissues. * Knowledge of kinematics and dynamics of the load bearing joints. | | | |

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| Date | Holder of course / signature, | Holder of practical activities / signature, |
| 12.09.2024 | Lecturer Sînziana Anca Butnaru-Moldoveanu, PhD | Lecturer Sînziana Anca Butnaru-Moldoveanu, PhD |

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| Date of approval in the Department Council/Teaching Council, | | |
| 19.09.2024 |  | Department director / signature, |

Associate Professor Daniela-Viorelia Matei, MD, PhD