FEDERAL UNIVERSITY OF SÃO CARLOS FOUNDATION

GRADUATE PROGRAM IN PHYSIOTHERAPY – PPGFt/CCBS/R

COURSE CHARACTERIZATION FORM

Graduate Program: Physiotherapy

Course Code: FIT-206

Credits: 2

Course Title: Clinical Biomechanics: Fundamental Principles and Applications

Start of Validity: 2025 – 1st Semester

Justification

This course evolved as part of the restructuring of the PPGFT curriculum, aiming to update and focus the content on fundamental biomechanical principles and their clinical applications in physiotherapy practice.

Course Workload

Theoretical Classes: 22 hours

Practical Classes: 8 hours

Exercises/Seminars: Not applicable

Course Syllabus

• Mechanical properties of non-contractile tissues (connective tissue, bone tissue, and articular cartilage) and their clinical implications

• Types of forces acting on the musculoskeletal system

• Load–deformation curve

• Responses of non-contractile tissues to applied forces

• Effects of immobilization/disuse, injury, and exercise on the mechanical properties of non-contractile tissues

• Mechanical properties of skeletal muscle and their clinical implications

• Muscle architecture

• Length–tension relationship

• Force–velocity relationship

• Application of muscle mechanics concepts to exercise

• Biomechanical principles and their implications for movement

• Scalar and vector quantities

• Free-body diagrams

• Anthropometry

• Newton’s laws

• Joint forces and moments (torques)

• Internal and external forces

• Internal and external joint moments (torques)

• Influence of joint angle changes

• Application of torque concepts in assessment and exercise

• Joint forces and moments during gait and other functional tasks

Nature of the Course

Specific to the Area of Concentration in Physiotherapy and Functional Performance.

Main Bibliography

Richards J. The Comprehensive Textbook of Clinical Biomechanics. 2nd ed. Elsevier, 2018.

Robertson DGE, Caldwell GE, Hamill J, Kamen G, Whittlesey SN. Research Methods in Biomechanics. 2nd ed. Human Kinetics, 2014.

Neumann DA. Kinesiology of the Musculoskeletal System. 3rd ed. Mosby, 2016.

Levangie PK, Norkin CC, Lewek MD. Joint Structure and Function: A Comprehensive Analysis. 6th ed. F.A. Davis Company, 2019.

Lieber RL. Skeletal Muscle Structure, Function, and Plasticity: The Physiological Basis of Rehabilitation. 3rd ed. Lippincott Williams & Wilkins, 2009.

Nordin M, Frankel VH. Basic Biomechanics of the Musculoskeletal System. 4th ed. Lippincott Williams & Wilkins, 2012.

Relevant articles published in scientific journals.

Main Responsible Faculty

Fábio Viadanna Serrão – Permanent Faculty

Paula Regina Mendes da Silva Serrão – Permanent Faculty

Approval

Approved at the 290th Ordinary Meeting of the PPGFT Graduate Program Committee on February 14, 2025.

São Carlos, February 19, 2025.

Prof. Dr. Tatiana de Oliveira Sato

Chair of the PPGFT Graduate Program Committee – UFSCar