# FEDERAL UNIVERSITY OF SÃO CARLOS FOUNDATION

# GRADUATE PROGRAM IN PHYSIOTHERAPY – PPGFt/CCBS/R

# COURSE CHARACTERIZATION FORM

**Graduate Program:** Physiotherapy

**Course Code:** FIT-214

**Credits:** 2

**Course Title:** Advanced Studies and Innovation in Photobiomodulation

**Start of Validity:** 2025 – 2nd Semester

## Justification

This course evolved as part of the restructuring of the PPGFT curriculum.

## Course Workload

Theoretical Classes: 22 hours

Practical Classes: 4 hours

Exercises/Seminars: 4 hours

## Course Syllabus

This course addresses basic and advanced concepts related to the therapeutic modality known as Photobiomodulation, formerly referred to as Laser Therapy. The course aims to provide students with a comprehensive understanding of the main physiological and therapeutic mechanisms of photobiomodulation resulting from the interaction of light emitted by lasers and light-emitting diodes (LEDs) with biological systems. In addition, current scientific evidence, different light-emitting devices used for photobiomodulation therapy, and dosimetry principles of this therapeutic modality are presented and discussed.

• History of photobiomodulation: principles and general concepts

• Lasers and LEDs: differences and similarities

• Mechanisms of action of photobiomodulation

• Dose–response and time–response relationships in photobiomodulation

• Physical parameters of photobiomodulation

• Light–tissue interaction (phototypes)

• Dosimetric calculations

• Devices used for photobiomodulation and dosimetry

• Therapeutic effects of photobiomodulation

• Evolution, innovation, and development of new photobiomodulation devices

## Nature of the Course

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

## Main Bibliography

Hamblin MR, Ferraresi C, Huang Y-Y, Freitas LF, Carroll JD. Low-Level Light Therapy: Photobiomodulation. SPIE Press, 2018.

Mester A, Mester A. The history of photobiomodulation: Endre Mester (1903–1984). Photomedicine and Laser Surgery, 2017.

Anders JJ, Lanzafame RJ, Arany PR. Low-level light/laser therapy versus photobiomodulation therapy. Photomedicine and Laser Surgery, 2015.

Heiskanen V, Hamblin MR. Photobiomodulation: lasers vs. light-emitting diodes? Photochemical & Photobiological Sciences, 2018.

de Freitas LF, Hamblin MR. Proposed mechanisms of photobiomodulation or low-level light therapy. IEEE Journal of Selected Topics in Quantum Electronics, 2016.

Ferraresi C, Hamblin MR, Parizotto NA. Low-level laser (light) therapy on muscle tissue: performance, fatigue, and repair. Photonics & Lasers in Medicine, 2012.

Agrawal T et al. Pre-conditioning with low-level laser (light) therapy: light before the storm. Dose-Response, 2014.

Huang YY et al. Biphasic dose response in low-level light therapy. Dose-Response, 2009.

Chung H et al. The nuts and bolts of low-level laser (light) therapy. Annals of Biomedical Engineering, 2012.

Young NC, Maximiano V, Arany PR. Thermodynamic basis for comparative photobiomodulation dosing. Journal of Biophotonics, 2022.

## Main Responsible Faculty

Cleber Ferraresi – Permanent Faculty

## Approval

Approved at the 294th Ordinary Meeting of the PPGFT Graduate Program Committee on June 13, 2025.

São Carlos, June 16, 2025.

Prof. Dr. Anielle Cristhine de Medeiros Takahashi

Chair of the PPGFT Graduate Program Committee and Coordinator of the PPGFT – UFSCar