

**ÁREA DE PESQUISA: AP5 - Simulação e Controle de Processos**

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**TÍTULO: Análise de Sustentabilidade e Otimização de fotobiorreatores iluminados artificialmente**

#### **RESUMO**

This project is concerned with the optimization and control of microalgae cultivation, with a focus on sustainability. Both in the integrated biorefinery concept and for isolated production, the biotechnology sector has explored various sustainable production routes for autotrophic microorganisms. Considering the operation of photobioreactors as the main focus, the control of photosynthetically active irradiance and its qualitative and quantitative variation can condition the biosynthesis pathways of interest and determine various indicators such as efficiency, productivity and sustainability. In this sense, this project aims to create a computational and experimental framework for analyzing the viability and sustainability of photobioreactors, providing guidelines for the feasibility and implementation of these biotechnological systems. The case study for this project will be the production of the microalga *Scenedesmus*, which has high biomass productivity and large quantities of specific bioproducts. The execution of this project includes the following main steps: (i) building a hybrid mathematical model (combining fundamental equations and machine learning based models) describing the microalgal production as a function of each respective illuminated wavelength; (ii) formulating objective functions based on the feasibility and sustainability of the process to obtain dynamic profiles for optimal control. (iii) Optimize the process and validate it experimentally.

**PALAVRAS-CHAVE:** Otimização, Cultivo de microalgas, fotobiorreator, análise de viabilidade e sustentabilidade.