

Robotics in Dental Production
A Methodology for the Design and Simulation
of Work Environments

by

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PREFACE

The development of industrial robotics has fundamentally changed modern manufacturing processes and brought new levels of precision, efficiency, and flexibility. In recent years, automation processes and modern digital technologies have also been increasingly applied in the dental industry, where they contribute to improving the quality, repeatability, and reliability of the production of dental implants and prosthetic components. However, the specifics of dental production — such as the need for microscopic precision, strict hygiene requirements, and a high degree of product customization — require special methodological approaches to the design and simulation of robotic work environments. The main objective of this monograph, entitled *Robotics in Dental Production: A Methodology for the Design and Simulation of Work Environments*, is to provide a theoretical and methodological basis for the analysis, design, and implementation of robotic workstations in dental production, with a particular focus on the manufacturing process of dental implants. The book combines theoretical and practical knowledge, highlighting the nature and importance of interdisciplinarity in scientific fields — especially industrial robotics and dental production. The theoretical part of the monograph introduces the fundamentals of industrial robotics, describes the main aspects of modern dental manufacturing, and characterizes the creation and use of simulation models and analyses, emphasizing their importance for optimizing manufacturing processes. These theoretical foundations are followed by the practical part, which presents the methodology for designing robotic workplaces,

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including the design framework and off-line programming procedures. This methodological approach is verified in practice in the final part of the monograph through the creation of a robotic workplace for the production of dental implants. This scientific monograph is intended for researchers, engineers, and professionals from academia and industry who are involved in the integration of robotics and digital simulation into manufacturing processes, with a specific focus on dental production.