

1. Record Nr.	UNINA9910847090703321
Titolo	Advances in Manufacturing IV : Volume 5 - Biomedical Engineering: Digitalization, Sustainability and Industry Applications / / edited by Filip Gorski, Rzvan Pcurar, Joaquín F. Roca González, Micha Rychlik
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2024
ISBN	3-031-56456-1
Edizione	[1st ed. 2024.]
Descrizione fisica	1 online resource (234 pages)
Collana	Lecture Notes in Mechanical Engineering, , 2195-4364
Disciplina	610.28
Soggetti	Biomedical engineering Industrial engineering Production engineering Signal processing Biomedical Devices and Instrumentation Industrial and Production Engineering Signal, Speech and Image Processing
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Preface -- Organization -- Contents -- Adapting Manufacturing Strategies for Future Challenges in Medicine -- The Medical Device Industry in a Kaizen Environment in the year 2050 -- 1 An Introduction -- 2 Research Problem -- 3 Research Method -- 4 Results -- 4.1 Scenario for Medical Devices in Costa Rica -- 4.2 Strategic Foresight to Identify Megatrends for the Year 2050 in the Medical Device Industry in a Kaizen Environmental in Costa Rica -- 5 Discussion -- 6 Conclusions -- References -- Continuous Improvement Programs: Before and After the COVID-19 Pandemic -- 1 Introduction -- 2 Literature Review -- 2.1 Success Factors for CI Programs -- 2.2 The COVID-19 Pandemic Impact -- 3 Research Method -- 3.1 Instrument Design -- 3.2 Sample Size and Selection -- 3.3 Data Collection and Data Analysis -- 4 Results -- 4.1 Interviewee's Demographic Information -- 4.2 Section I. Background Questions: Program Level -- 4.3 Section II. Project Identification and Selection -- 4.4 Section III. Planning and Management -- 4.5 Section IV. Closing --

4.6 Section V. Critical Success Factors for a Continuous Improvement Program -- 5 Discussion -- 5.1 Conclusion -- 5.2 Theoretical and Practical Approach -- 5.3 Limitations -- 5.4 Future Research Lines -- References -- Enhancing Medical Manufacturing Through Digitalization -- Objective and Subjective Factors Affecting Neurodiverse Inclusion in Manufacturing -- 1 Introduction -- 2 Cognitive Maps of the Barriers to Inclusion -- 3 Survey Among Industry Employees -- 4 Discussion and Comparison Among the Two Analyses -- 5 Conclusions -- References -- A Human-Robot Collaboration Workstation Design to Assess Worker Physical Workload with JACK Software -- 1 Introduction -- 2 Method -- 2.1 Experimental Set up -- 2.2 Experimental Procedure -- 3 Results -- 4 Discussion -- 5 Conclusions -- References.

Automation of the Determining Parameters Process Used to Assess the State of Hip Joint Degeneration Based on CT Imaging -- 1 Introduction -- 2 Background -- 2.1 Hip Joint Anatomy -- 2.2 Loads in the Hip Joint -- 2.3 Osteoarthritis of the Hip Joint -- 2.4 Parameters Characterizing the Acetabulum of the Hip Joint -- 3 State of the Art -- 4 Case Study -- 4.1 Input Data -- 4.2 Determination of Reference Planes and Origin -- 4.3 Determination of the Acetabulum Volume -- 4.4 Determination of the Acetabular Axis Relative to the Reference Planes -- 4.5 Results of Measurements of the Determined Parameters -- 5 Automation of the Process of Determining Planes and Parameters -- 6 Validation of the Developed Method -- 7 Summary -- References -- Advanced Manufacturing Methods for Customized Medical Implants -- AI-Based Automated Custom Cranial Implant Design - Challenges and Opportunities with Case Study -- 1 Introduction -- 2 Related Work -- 3 DeepImplant - Automated AI-Based Cranial Implant Reconstruction System -- 3.1 Reconstruction Module -- 3.2 Reconstruction Module -- 3.3 Plugin Manager Module -- 4 Discussion and Conclusions -- References -- Ti Implant Surface State After Micro-Arc Oxidation Process -- 1 Introduction -- 2 Experimental Details -- 3 Results and Discussion -- 4 Summary -- References -- Research on Mechanical Characteristics of 3D-Printed PEEK Material-Based Lattice Structures for Vertebral Implants -- 1 Introduction -- 2 Design of PEEK Material-Based Vertebral Implant -- 3 Finite Element Analysis to Estimate the Mechanical Behavior of the Implant -- 4 The Manufacturing Process of the Vertebral Implant and Samples -- 5 Compression and Vickers Hardness Tests -- 5.1 Compression Tests -- 5.2 Vickers Hardness Test -- 6 Conclusions -- References -- Research on Design and Manufacturing of PEKK-Based Mandibular Implants by Fused Deposition Modeling.

1 Introduction -- 2 The Designing Process of the Mandibular Model Implants -- 3 Finite Element Analysis to Estimate the Mechanical Behavior of the Mandibular Implant -- 4 The Manufacturing Process of the Mandibular Implant -- 5 Mechanical Tests -- 5.1 Tensile Testing -- 5.2 Bending Testing -- 6 Conclusions -- References -- Assessment of the Usefulness of Additively Manufactured Anatomical Models in the Process of Preoperative Support and Education -- 1 Introduction -- 2 Methods and Materials -- 3 Results -- 4 Discussion -- 5 Conclusions -- References -- Research on Design and Manufacturing of Pelvic Bone Structure by Fused Deposition Modeling Method -- 1 Introduction -- 2 Design Variants of Pelvic Bone Structures -- 3 Finite Element Analysis of Samples with Porous Structures to Estimate Their Mechanical Behavior -- 4 The Manufacturing Process of Samples -- 5 Mechanical Test of the 3D Printed Samples -- 5.1 Compression Testing Experiments -- 5.2 Flexural Testing Experiments -- 5.3 Tensile Testing Experiments -- 6 Finite Element Analysis to Determine the Mechanical

Behavior of Pelvic Bone -- 7 3D Printing Manufacturing of the Pelvic Bone -- 8 Conclusions -- References -- Innovations in Prosthetic Design and Manufacturing -- Design of Personalized Orthoses with Support of PTC Creo and FDM Technology -- 1 Introduction -- 2 Design of Personalized Orthoses -- 3 Fabrication of Physical Model -- 3.1 Process Parameters for Manufacturing -- 3.2 Results -- 4 Discussion -- 5 Conclusions -- References -- Design and Finite Element Analysis of a Custom Wrist Orthosis for 3D Printing Containing Ventilation Areas and Wrist Protection Zones Achieved by Topological Optimization -- 1 Introduction -- 2 Examples of Topological Optimization in the Design of Orthoses and Prostheses -- 3 Medical Requirements and Design Assumptions Adopted for the Designed Orthosis.

3.1 Preparation of an Initial Model of the Wrist Orthosis Based on a 3D Scan of the Patient's Forearm -- 3.2 Topological Optimization of a 3D Model of a Wrist Orthosis -- 4 Finite Element Analysis Results for a Wrist Orthosis Model Developed by Topological Optimization -- 4.1 Finite Element Analysis of a Full Geometry Initial Orthosis Model -- 4.2 Results of Finite Element Analysis of a Orthosis Geometry After Topological Optimization -- 4.3 Finite Element Analysis of Orthoses with Optimized Geometry After Corrections Related to the Minimization of Adverse Stresses -- 5 Discussion and Conclusions -- References -- Development of 3D Printed Low-Cost Individualized Actuated Upper Limb Prostheses -- 1 Introduction -- 2 Materials and Methods -- 2.1 The AutoMedPrint System and Study Concept -- 2.2 Patient Case Description and Manufacturing of Mechanical Prostheses -- 2.3 Design of Mechatronic Prostheses -- 2.4 Manufacturing, Assembly and Programming -- 2.5 Methodology of Prostheses Evaluation -- 3 Results -- 3.1 Manufacturing, Assembly and Functional Testing -- 3.2 Evaluation Results and Discussion -- 3.3 Conclusions -- References -- Comparison of Environmental Analysis Results from Two IT Tools Based on an Additive Manufactured Prostheses -- 1 An Introduction -- 2 Literature Analysis -- 2.1 Ecodesign -- 2.2 Environmental Analysis Methods -- 2.3 IT Tools to Support LCA Environmental Analysis -- 3 Research Methodology -- 3.1 Product Description for Analysis -- 3.2 Selection of IT Tools for Analysis -- 4 Research -- 4.1 Lifecycle Modeling -- 4.2 Comparison of Results and Work in the Systems -- 5 Conclusions -- References -- Virtual Design Process of Customized 3D Printed Modular Upper Limb Prostheses -- 1 Introduction -- 2 Research Methodology -- 2.1 Concept and Purpose of Research -- 2.2 The Course of the Study -- 2.3 Building the VR Configurator in Unity. 2.4 Methodology of Testing and Evaluation -- 3 Results -- 3.1 Results of Application Building -- 3.2 Test Results -- 4 Conclusions -- References -- Author Index.

Sommario/riassunto

The book covers timely topics in digital healthcare and personalized medical products. It delves into the use of digital technologies like image processing, CAD, AI, and 3D printing in healthcare, emphasizing their role in customizing treatment and manufacturing medical products. Based on peer-reviewed contributions to the 8th International International Scientific-Technical Conference (MANUFACTURING 2024) held on May 14-16, 2024, in Poznan, Poland, the chapters reports on achievements from interdisciplinary collaborations between engineers, doctors, and the medical industry. All in all, this book offers a timely guide for researchers and professionals in medical design, manufacturing, and biomedical engineering, and a bridge fostering communication and collaborations between different stakeholders working on enhancing health interventions through technology.
