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EMERGING TRENDS IN ADVANCED MATERIAL & APPLICATIONS

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Preface

It gives me immense pleasure to present this book, which brings together a diverse collection of research works reflecting the evolving landscape of mechanical engineering, manufacturing technology, and sustainable design. The chapters compiled in this volume represent a thoughtful blend of theoretical insight, experimental investigation, and practical application, making it a valuable contribution for students, researchers, and professionals alike.

The book begins with detailed studies on Wire Electrical Discharge Machining (WEDM), focusing on optimization of process parameters using Taguchi's method and performance analysis of wire electrodes during machining of austenitic steel alloys. These chapters highlight the importance of precision manufacturing and statistical techniques in improving machining efficiency and product quality.

Further enriching the content, the work on line balancing using a Six Sigma approach addresses real-world production challenges, demonstrating how systematic methodologies can enhance productivity and reduce inefficiencies in industrial workstations. The inclusion of ergonomic design for VDT workstations tailored for specially abled individuals reflects a strong commitment to human-centered design and inclusivity in engineering practices.

The book also explores innovative applications of materials and design through chapters on artificial limbs using fiber-reinforced polymer composites and vibration transmissibility in stone cutter handles with different rubber fillings. These studies emphasize the role of engineering in improving quality of life and occupational safety.

Advanced simulation and analysis techniques are well represented through finite element analysis of nonlinear thermal contact problems and truck chassis analysis using steel and carbon fiber components. These contributions showcase the increasing reliance on computational tools to predict performance and optimize structural designs.

Finally, the chapter on fly ash composite bricks presents a sustainable approach to construction materials, aligning with global efforts toward environmental conservation and resource efficiency. It underlines the significance of integrating sustainability into engineering solutions.

Overall, this book serves as a comprehensive resource that bridges traditional manufacturing practices with modern advancements in materials, optimization techniques, ergonomics, and sustainability. The collaborative efforts of the authors reflect dedication, innovation, and a forward-thinking approach to engineering challenges.

I am confident that this volume will inspire further research and provide valuable insights to its readers.

Dr. Sumita Chaturvedi

Dr. Mohd Faizan Hasan

Dr. Shahnawaz Alam

TABLE OF CONTENT

1. OPTIMIZATION OF PROCESS PARAMETERS OF WEDM USING TAGUCHI'S METHOD	1 - 25
<i>Mohd Sahil, Mohd Faizan Hasan</i>	
2. PERFORMANCE ANALYSIS OF WIRE ELECTRODE ON MACHINING OF AUSTENITIC STEEL ALLOY USING WEDM	26 - 49
<i>Lukman , Mohd Faizan Hasan</i>	
3. ANALYSIS OF LINE BALANCING PROBLEM FOR PRODUCTION OF FUEL TANK MOUNTING BRACKET IN WORK STATION BY USING SIX- SIGMA APPROACH	50 - 74
<i>Ashish Kumar Kaushik, Dr. Abhishek Dwivedi</i>	
4. DESIGNING ARTIFICIAL LIMBS WITH FIBER-REINFORCED POLYMERIC COMPOSITES	75 - 81
<i>Fazal abbas, Dr. Sumita Chaturvedi and Dr. Prem Kumar Bharti</i>	
5. ERGONOMIC DESIGN OF VDT WORKSTATION FOR ESPECIALLY ABLED PERSONS	82 - 90
<i>Muhammad Farhan, Shara Khursheed</i>	

- 6. EFFECT OF FILLING THE DIFFERENT TYPES OF RUBBERS IN THE HANDLE OF THE STONE CUTTER ON VIBRATION TRANSMISSIBILITY** **91- 109**
Dr. Mohammad Seeraj, Fazle Rab
- 7. FINITE ELEMENT ANALYSIS OF NONLINEAR THERMAL CONTACT AT SHAFT AND HOLE INTERFACE** **110 - 141**
Mohd Reyaz Ur Rahim Dhananjay Rai
- 8. TRUCK CHASSIS ANALYSIS USING FINITE ELEMENT METHOD FOR STEEL AND CARBON FIBER COMPONENTS** **142 - 156**
Gyan Prakash, Shahnwaz Alam, Kamran Rasheed
- 9. ADVANCEMENTS IN FLY ASH COMPOSITE BRICKS: A SUSTAINABLE APPROACH TO CONSTRUCTION MATERIALS** **157 - 163**
Mahesh Kumar, Dr Prem Kumar Bharti and Dr. Sumita Chaturvedi
- 10. 3D PROSTHETIC HAND: ADDITIVE MANUFACTURING** **166 – 188**
Raihan Ahmad, Sumita Chaturvedi Mirza Juned Beig