

Table of Contents

Preface

Chapter 1: Research and Design in Mechanical Engineering

Finite Element Analysis (FEA) of Electric Power Distribution Pole Geometries with Material Classification	
T. Jamil, M. Yousuf, M.T. Khan, A. Malik, J. Saleem, S.Z. Abbas and M.H. Arif	3
Aeroacoustics Noise and Performance Analysis of Vortex Tube: A CFD Approach	
M. Aadil, F. Ali, A. Wazir and K. Akhtar	17
Thermal Performance Analysis of LaNi Metal Hydride Reactors Using Multiple Heating-Tube Configurations and Fin Enhancements	
M.A. Jabbar, N.u.H. Shah, M. Usman, I.S. Bhatti and M. Ali	37
Experimental Evidence for Thrust Enhancement in Propellers Using Tubercle-Designed Blades	
A. Saeed, S. Irfan, I.B. Ahsan, M. Muntaha, J.A. Khan and S.W. Hasan	55
Design and Development of an Uncrewed Surface Vessel (USV) for Hydrographic Survey	
B.P. Bheem, K. Noor, Z. Riaz, J.A. Khan, S.A. Khan, F.U. Rehman and M. Yasrab	61
Machine Learning Based Predictive Modeling of Machining Performance of Ti-6Al-4V under MQL Lubricating Conditions	
M. Jawad, U. Habiba, B. Hassan, M. Jahanzaib, S. Hussain and W. Ahmed	71

Chapter 2: Mechatronics

Capacity Degradation Estimation of Lithium-Ion Batteries Using Explainable Machine Learning	
Q.M. Mirza, H. Akram, A. Tahir, H. Elahi and M.A. Tayyab	87
Synergizing Industry 5.0 and Edge Intelligence: A Multi-Modal Object Classification Model Using Boosted Feature Cascades	
M.D. Saleem and M. Wasif	97
Sensor Based Hard Switching Collision Avoidance Strategy for Hovering Autonomous Underwater Vehicles	
F.U. Rehman, Z. Riaz and A. Raza	103

Chapter 3: Photovoltaic Energy Systems

Hybrid Low-Concentration PV/T with Nano-PCM Cooling and Thermoelectric Energy Recovery	
M.M. Sultan, R. Saghir and A. Hussain	121
Technical Assessment of a Catamaran-Based Offshore Floating Photovoltaic System for Sheltered Coastal Waters	
M.A. Mehtab, M.I. Arshad, S.A. Khan, S.H.M. Zaidi and Z. Riaz	141

Chapter 4: Biogas and Hydrogen Production

Integrated Industrial Economic Design and Multi-Objective Optimization of a Sustainable Biomethane Production System for Decentralized Energy Generation	
Z. Ahmad, M. Uzair and H. Ali	153
In Situ Decarbonization of SMR Hydrogen: A Comparative Exergy - Machine Learning Framework for Blue and Green Hydrogen Ascendancy	
A. Hasni, M. Junaid, S.M. Raza and H. Ahmed	165

Chapter 5: Engineering Management and Manufacturing Operations Management

Energy Auditing: A Mandatory Pathway for EDGE and LEED Green Building Standards S.A. Naseem, M.M. Amman and A. Rashid	185
Comprehensive HIRA of Paint Shop in Gas Meter Manufacturing Plant with Compliance of ISO Standards M. Hamid, I. Sikandar, M. Azam, M.H. Naqvi, H. Ahmed and A. Zulfikar	205
Exploring Quality 4.0: A Systematic Review of Technological Enablers and their Impact on Quality Management H. Sami, M. Wasif and A. Fatima	217
Multi-Objective Flexible Job-Shop Scheduling with Flexible Workers and Ergonomic Factors via an Improved NSGA-II S. Usman, P. Zhang, Z.H. Fu, T.R. Ye, S. Ali, W.W. Qin, Z.X. Li, Y.F. Wang, Y.L. Gong and C.M. Gao	229