



## Department of Mechanical Engineering

### FIST LAB

**Faculty In-charge:** Dr. Priyaranjan Sharma (PDF - IIT Bombay, PhD - NIT Karnataka)

Associate Professor, Department of ME

#### 1. Brief Description about the Laboratory:

The FIST Laboratory, under the Department of Mechanical Engineering, is a state-of-the-art facility equipped with advanced instruments and technologies. Funded by the FIST Project [Ref. No: SR/FST/ETI-317/2012] and SERB Project [Ref. No: SERB/F/2077/2015-16 dated 12/07/2015], this laboratory supports cutting-edge research and innovation. It houses high-precision equipment such as Wire-EDM, Coordinate Measuring Machine, Robotic Manipulator, CNC Machines tool, 3D printers, and advanced material testing systems, which are essential for modern mechanical engineering studies. The lab provides an excellent environment for students, researchers, and faculty to collaborate on interdisciplinary projects, pushing the boundaries of mechanical engineering. This enhanced laboratory infrastructure not only supports rigorous academic inquiry but also provides practical, hands-on experience, preparing students to meet the demands of the industry. This laboratory has significantly enhanced the department's capabilities, fostering academic excellence and practical skill development in mechanical engineering.

#### 2. Equipment of Equipment and Cost:

S NO	NAME OF EQUIPMENT	COST (In Lakh)
1	CNC WIRE CUT EDM (Model: Eco-cut)	18.63
2	XL TURN (Model: M tab)	13.00
3	ROBOTIC MANIPULATOR (Model: IRB-1600)	18.75
4	COORDINATE MEASURING MACHINE (Model: GRANO 4-5-4 DCC)	19.87
5	3D PRINTING (Model: U print, SE plus)	28.00

### 3. Equipment's Photo:

#### 3.1 CNC WIRE CUT EDM (Model: Eco-cut)



CNC WIRE CUT EDM (Model: Eco-cut)

#### 3.2 XL TURN (Model: M tab)



XL TURN (Model: M tab)

### 3.3 ROBOTIC MANIPULATOR (Model: IRB-1600)



**ROBOTIC MANIPULATOR (Model: IRB-1600)**

### 3.4 COORDINATE MEASURING MACHINE (Model: GRANO 4-5-4 DCC)



**COORDINATE MEASURING MACHINE (Model: GRANO 4-5-4 DCC)**

### 3.5 3D PRINTING (Model: U print, SE plus)



3D PRINTING (Model: U print, SE plus)

#### 4. Outcome of the LAB:

**4.1 Research Project:** Received seed money research grant of 4.5 Lakhs with Ref. No: KLEF/SRG/2023-24/ME/005] for a research project on “Cost-effective Porous Titanium Implants using Ultrasonic-assisted Pulse-electrodeposition and WEDM process for improved Osseointegration”.

#### 4.2 PhD Scholars: 03

1. Mr. Ramatenki Chinna - 2300244 [Category: Full-time; Status: On-going]
2. Mr. Vidyanand - 2300575 [Category: Part-time; Status: On-going]
3. Mr. Rajesh Kumar K - 163070051 [Category: Part-time; Status: On-going]

#### 4.3 Patents:

- Republic of South Africa Utility Patent on “AI-IOT BASED CYLINDER TROLLEY SYSTEM AND THEREOF” with Application Number: 2023/07522, Accepted on 2024/01/31. (Status: Published Online, Granted)
- Indian Utility Patent on "Processing Barriers: Empirical Modelling for Predictive Excellence in Magnesium Alloy Friction Stir Welding" with Application Number:

202441000621, Publication Number: 05/2024, Publication Date: 02/02/2024 (Status: Accepted, Published Online, Not granted)

- Indian Design Patent on “Trisukh – A Multi Operational Farming Machine” with Application Number: 383050-001, Cbr Number: 204262, Journal No – 27/2023, Journal Date – 07/07/2023 (Status: Design Accepted and Published).
- Indian Design Patent on “Medical Injector Pen” with Application Number: 396155-001, Journal Number: 45/2023, Cbr Number: 212112, Journal No – 45/2023, Journal Date – 10/11/2023 (Status: Design Accepted and Published).
- Indian Design Patent on “Threading Tap Set with internal holes for Lubrication” with Application Number: 401929-001, Cbr Number: 215711, Journal No – 18/2024, Journal Date – 03/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Foldable Desk and Bench” with Application Number: 410023-001, Cbr Number: 203959, Journal No – 18/2024, Journal Date – 03/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Smart Broom Stick” with Application Number: 408398-001, Cbr Number: 202963, Journal No – 19/2024, Journal Date – 10/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Air Purifier” with Application Number: 412085-001, Cbr Number: 205329, Journal No – 19/2024, Journal Date – 10/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Tree & Branch Cutting Machine” with Application Number: 412245-001, Cbr Number: 205409, Journal No – 20/2024, Journal Date – 17/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Automated Plastic Bag Recycling Machine” with Application Number: 412246-001, Cbr Number: 205409, Journal No – 21/2024, Journal Date – 24/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Solar-Powered Pest Repellent for Agriculture” with Application Number: 412840-001, Cbr Number: 205752, Journal No – 21/2024, Journal Date – 24/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Solar Powered Roof Cleaning Robots” with Application Number: 414498-001, Cbr Number: 206686, Journal No – 21/2024, Journal Date – 24/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Floor Cleaner Robot” with Application Number: 413618-001, Cbr Number: 206254, Journal No – 22/2024, Journal Date – 31/05/2024 (Status: Design Accepted and Published).

- Indian Design Patent on “Rainwater Harvesting Device” with Application Number: 413712-001, Cbr Number: 206320, Journal No – 22/2024, Journal Date – 31/05/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Solar Powered Agriculture Robot” with Application Number: 412405-001, Cbr Number: 205475, Journal No – 23/2024, Journal Date – 07/06/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “Water Tap with Built-In Storage Container” with Application Number: 414539-001, Cbr Number: 206700, Journal No – 23/2024, Journal Date – 07/06/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “FlutterGuard: Eco-Friendly Precision Farming” with Application Number: 414376-001, Cbr Number: 206603, Journal No – 24/2024, Journal Date – 14/06/2024 (Status: Design Accepted and Published).
- Indian Design Patent on “NeuroSpectrum: Enhancing Autism Interaction with Wearables” with Application Number: 415348-001, Cbr Number: 207209, Journal No – 24/2024, Journal Date – 14/06/2024 (Status: Design Accepted and Published).

#### **4.4 Research Papers:**

1. **Priyaranjan Sharma**, Hargovind Soni, Sunita Sethy, Sudhansu Ranjan Das, Mohammed Y. Tharwan, Sharaf Al Sofyani, Abdel-Hamid I. Mourad\*, Ammar Elsheikh (2023). Surface characterization of SS-304 after WED cutting: An experimental investigation and optimization. *Journal of Materials Research and Technology*, Elsevier, (**SCI Indexed, IF: 6.267**), DOI: 10.1016/j.jmrt.2023.02.183.
2. Ashis Tripathy, **Priyaranjan Sharma\*** & Noor Azuan Abu Osman (2024). Synthesis, fabrication and characterization of CaMgFexTiyO12-based electro-ceramics sensor. *J Mater Sci: Mater Electron*, **Springer Nature**, 35, 492. (**SCI Indexed, IF: 2.97**), DOI: 10.1007/s10854-024-12100-x.
3. Julfekar Arab, **Priyaranjan Sharma**, & Shih-Chi Chen (2024). Fabrication of Micro-Holes in PMMA Using Micro-ECDM Process: Geometric Characteristics and EC Discharge Behaviour, *Journal of The Electrochemical Society*, IOP Science, 171, 053506 (**SCI Indexed, IF: 4.386**), DOI: 10.1149/1945-7111/ad4a0d.
4. Raj Kumar Pittala, **Priyaranjan Sharma\***, Gajanan Anne, Sachinkumar Patil, Vinay Varghese, Sudhansu Ranjan Das, Ch Sateesh Kumar\* and Filipe Fernandes (2023). Development and Mechanical Characterization of Ni-Cr Alloy Foam Using Ultrasonic-Assisted Electroplating Coating Technique. *Coating*, MDPI, 13(6), 1002 (**SCI Indexed, IF: 3.4**), DOI: 10.3390/coatings13061002.

5. Gajanan M. Naik, **Priyaranjan Sharma\***, Gajanan Anne, Raj Kumar Pittala, Rahul Kumar, Gnane Swarnadh Satapathi, Ch Sateesh Kumar and Filipe Fernandes (2023). Improvement in Corrosion Performance of ECAPed AZ80/91Mg Alloys Using SS316 HVOF Coating. *Materials*, MDPI, 16(20), 6651, (**SCI Indexed, IF: 3.4**), DOI: doi.org/10.3390/ma16206651.
6. Raj Kumar Pittala, **Priyaranjan Sharma\***, Gajanan Anne, Julfekar Arab, Deepak Rajendra Unune, Ch Sateesh Kumar, and Filipe Fernandes (2024). Synthesis and characterization of open cell Ni-Cr foam developed using Pulse electro deposition technique for filtration applications, *Proc IMechE Part B: J Engineering Manufacture*, (**SCIE Indexed, IF: 2.6**), DOI: 10.1177/095440542412389.
7. Gajanan Anne, Ramesh S, **Priyaranjan Sharma**, Maruthi Prashanth B H, Aditya Kudva S, K Prakash, Sandeep Sahu, Nagaraj Bhat (2024). Enhancing wear resistance of AZ61 alloy through friction stir processing: Experimental study and prediction model. *Materials Research Express*, (**SCIE Indexed, IF: 2.3**), DOI: 10.1088/2053-1591/ad4e0a.
8. Sunita Sethy, Jaydev Rana, **Priyaranjan Sharma**, and Sudhansu Ranjan Das\* (2024). Comparative performance investigation and sustainability assessment in electrical discharge machining of SS316 using different dielectrics. *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science*, 238(7), 2718-2733, Sage Journals, (**SCI Indexed, IF: 2.0**), DOI: 10.1177/09544062231195.
9. Gajanan Anne; Ananda Hegde; **Priyaranjan Sharma**; Aditya Kudva S; Prakash K; Mahanthayya Matapati; Ramesh S; Sathyashankara Sharma (2024). Erosion and corrosion behavior of Mg-Zn-Mn alloy developed through multidirectional forging and heat treatment, *Journal of Mechanical Science and Technology*, 38(3), Springer, (**SCIE Indexed, IF: 1.6**), Accepted for publication.
10. Aditya Kudva, Gajanan Anne, S Ramesh; **Priyaranjan Sharma**, Jagadeesh C, Lingaraj Ritti, Gajanan Naik, and G Divya Deepak (2024). Enhancing surface integrity of biodegradable Mg-Zn based alloy through cryo-ball burnishing; modeling using FEA, *Journal of Mechanical Science and Technology*, 38(3), 1175-1185, Springer, (**SCIE Indexed, IF: 1.6**), DOI: 10.1007/s12206-024-0214-x.
11. Smita Padhan, Naresh Kumar Wagri, Lalatendu Dash, Anshuman Das, Sudhansu Ranjan Das, Mohammad Rafiqhi, and **Priyaranjan Sharma** (2023). Investigation on surface integrity in hard turning of AISI 4140 steel using recently developed SPPP-AlTiSiN coated carbide insert under nanofluid-minimum quantity lubrication, *Lubricants*, MDPI AG, 11(2), 49, (**SCIE Indexed, IF-3.42**), DOI: 10.3390/lubricants11020049.

12. Soumikh Roy, Anshuman Das, Ramanuj Kumar, Sudhansu Ranjan Das, Mohammad Rafighi, and **Priyaranjan Sharma** (2024). Exploring the viability of alternative cooling-lubrication strategies in machining processes: A comprehensive review on the performance and sustainability assessment, Proc IMechE Part B: J Engineering Manufacture, (**SCIE Indexed, IF: 2.6**), DOI: 10.1177/09544054241229472.
13. Maruthi Prashanth B H, Ramesh S, P.S. Shivakumar Gouda, Gajanan M Naik, **Priyaranjan Sharma**, C Jagadeesh, Mahantesh M Math, Gajanan Anne (2024). Impact of ply stacking sequence on the mechanical response of Hybrid Jute-Banana fiber phenoplast composites. Materials Research Express, 11 (2024) 055301, (**SCIE Indexed, IF: 2.3**), DOI: 10.1088/2053-1591/ad425c.
14. Priyaranjan Samal, Himanshu Raj, Arabinda Meher, B. Surekha, Pandu Ranga Vundavilli, **Priyaranjan Sharma** (2024). Synergistic Effect of B4C and Multi-walled CNT on Enhancing the Tribological Performance of Aluminum A383 Hybrid Composites. Lubricants, MDPI AG, 12(6) (**SCIE Indexed, IF-3.42**), DOI: 10.3390/lubricants12060213.
15. Gajanan Anne, Vishwanatha H.M., **Priyaranjan Sharma**, Aditya Kudva S, Uzwalkiran Rokkala, Jagadeesh C, Nagaraj Bhat (2024). Prediction and comparison of Structure-Property relations using artificial neural network (ANN) approach in the Mg-Ce-Al hybrid composite developed via accumulative roll bonding. International Journal on Interactive Design and Manufacturing, Accepted for publication. (**SCOPUS & ESCI Indexed, IF: 2.2**).
16. Sudhy S Panicker, K Jithesh, PV Sivaprasad, **Priyaranjan Sharma**, Vinay Varghese (2023). Spring Back Investigations in Aluminium and Stainless-Steel Sheets. International Journal of Vehicle Structures & Systems (IJVSS), 15(6), p825, (**SCOPUS Indexed, IF: 0.57**), DOI: 10.4273/ijvss.15.6.16.
17. Daniel Samuel Parmar, Giphin George, **Priyaranjan Sharma** (2024). Liquid-Cooled Battery Thermal Management System: A Numerical Investigation of Effect of Coolant Path and Flow Rate Optimization, Journal of Polymer & Composites, STM Journals, 11(8), S11-S18, (**ESCI Indexed**).

Lab Incharge

Head of the Department