

Debanjan Maity

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Research interests

- Thermomechanical processing
- Process-microstructure-property correlations
- Numerical modelling of manufacturing processes
- In situ process monitoring
- Smart manufacturing and digital twin
- Digital image correlation

Education

Ph.D. • January, 2021-July, 2025 • Indian Institute of Technology, Kharagpur, India • Mechanical Engineering • CGPA: 9.25**

M.TECH • 2018 • Indian Institute of Technology, Kharagpur, India • Mechanical Engineering • CGPA: 9.56 (Rank 1st in the department)

B.E. • 2015 • Jadavpur University, Kolkata, India • Production Engineering • CGPA :8.22

** No rank, class, or division is awarded. There is no system for conversion of the final grade into a percentage of marks. However, for reference, the average grade point per credit corresponding to the letter grades is calculated to determine the CGPA.

Postdoc experiences

Indian Institute of Technology Kharagpur | Department of Mechanical Engineering | Postdoctoral researcher | March, 2025- Aug, 2025

Design and development of an automated WAAM deposition CNC machine for repairing railway turnouts

- Design and develop a CNC controlled WAAM deposition machine customized for railway turnout repair.
- Select and qualify high-carbon content filler materials to restore hardness and wear resistance of turnout components.
- Perform calibration and integration of an ESP32-based joystick controller for WAAM deposition.
- Estimate deposition geometry from laser-scanned profiles.

Indian Institute of Science Bangalore | Department of Mechanical Engineering | Research Associate | Sept, 2025- Present

1. Design and development of hybrid multistage additive/subtractive/inspection system for smart manufacturing
 - Develop compact linear delta kinematics-based modules tailored for hybrid manufacturing applications.
 - Optimize structural stiffness and kinematic accuracy within a reduced footprint.
 - Develop strategy for reconstruction of 3-D surfaces from laser scanned additively manufactured objects in the inspection module.
2. Study effect of surface modifications on the machinability of additively manufactured Inconel
 - Use Digital Image Correlation (DIC) during machining of surface modified Inconel to study the strain and deformation during machining.
3. Develop strategy for fabrication of electromagnetic waveguide structure using laser-DED

Work experiences

Tata Motors | Engineering Research Center, Pune | Senior Manager | August, 2018- Dec, 2020

Responsible for testing of automotive transmission components

- Validation of transmission aggregate related to non-BS-VI & BS-VI after receipt of test transmission /components/sub-assembly with required input & report release.
- Generate innovative solution in the field of Transmission, Proof-of-Concept was developed.
- Development of new test methodologies and capture of field failures and customer sensitive issues or test productivity with release of new/revision in work instruction.
- Employee development by building technical competencies within Transmission Testing to enhance in-house capabilities.

Copyright Filed:

- Diary No: 13367/2019-CO/SW “Transmission aggregate duty cycle development from drive cycle data”; Tata Motors Ltd. Idea Ref no.: 9645
- Diary No: 14657/2019 -CO/SW “Bearing duty cycle estimation software”; Tata Motors Ltd. Idea Ref no.: 9817

Thesis projects

Ph.D. Project | 2021-2025

Fabrication and analyses of large area spot welds for Al-Cu dissimilar metal joining in lap and sandwich configurations using a new friction processing method (Under the supervision of Prof. Vikranth Racherla)

- Demonstrate the newly developed friction processing technique for “large area spot welds” of Al/Cu dissimilar metal sheets.
- Estimate variable interdiffusion coefficients (Cu into Al and vice versa) at solid liquid interface from MD simulation.
- Optimize the developed friction processing technique to obtain a “Cu-Al-Cu large area sandwich spot weld”.
- Implement a “digital twin for real time monitoring and controlling of weld interface temperature”.

M.Tech. Project | 2017-2018

Synthesis and Finite Element Analysis of Open cell Copper Foam Developed with Friction Stir Forging (Under the supervision of Prof. Vikranth Racherla)

- Fabrication of open cell copper foam through sintering and dissolution process.
- Development of an add-on kit for rapid, low-cost friction sintering method.
- 3-D finite element process modelling using unit cell approach.

B.Tech. Project | 2014-2015

An approach to optimize the process parameters of laser transmission welding using firefly algorithm (Under the supervision of Prof. A.S. Kuar)

- Investigation of laser transmission welding process for natural and opaque acrylic plaques.
- Optimization of process parameters using firefly algorithm, a population-based metaheuristic and bio-inspired algorithm.

Skills and expertise

Technical Skills: ABAQUS with Python scripting, Solid Works, MATLAB, TSL OIM (EDAX), LAAMPS software package (Basics), OVITO, X’pert High score, Python.

Expertise: Process-microstructure-performance correlations, Real time process monitoring, Finite

Element Method, Numerical Modelling of Manufacturing Processes, Coupled temperature displacement analysis in thermomechanical processes, Mechatronics, Digital image correlations.

Awards and achievements

- Awarded the **Prime Minister Research Fellowship** from Ministry of Education, Government of India.
- **Rising Star Award**
from TATA Motors Ltd. for efforts and dedication to the organization.
- **Institute Silver Medal**
for being recognized as the best student in order of merit among the graduating MTech students of the department of Mechanical Engineering.
- **BADRI NARAYAN SINGH MEMORIAL Endowment prize for the academic year 2017-18**
for being adjudged to be the best scoring the highest CGPA at the end of 4th semester among all outgoing MTech students of MTech course in the department of Mechanical Engineering.
- Secured Rank 12 in Gate 2016 (Production and Industrial Engineering)

Patents

From PhD work:

- A system and method for diffusion bonding of dissimilar metals by friction processing. (**Granted Patent No: 494783**, Patent Application No: 202231058874) (India)(**Granted**).
- System for real-time temperature monitoring of weld interface in a friction processing technique. (**Patent application no: 202331029284**) (India)(**Published**).

Journal publications

From PhD work:

- **Maity, D.** and Racherla, V., 2023. A new friction processing method for welding of dissimilar metals. *Materials Today Communications*, 35, p.106095.
- **Maity, D.**, Radhakrishnan, P., Mala, M. and Racherla, V., 2023. Real-time temperature monitoring of weld interface using a digital twin approach. *Measurement*, 219, p.113278.
- **Maity, D.** and Racherla, V., 2024. Effect of SiC interlayer on microstructure and joint strength of Cu-Al welds obtained using a new friction processing method. *CIRP Journal of Manufacturing Science and Technology*, 52, pp.73-85.

- **Maity, D.**, Jha, R.K., Mandal, S. and Racherla, V., 2025. Melting phenomenon in Cu-Al joining using a novel friction processing technique: A molecular dynamics study. *Materials Today Communications*, 42, p.111354.
- **Maity, D.** and Racherla, V., Influence of SiC interlayer on mechanical and electrical joint characteristics of Cu-Al-Cu sandwich welds obtained using a new friction processing technique. *Journal of Materials Processing Technology*, 337, p.118737.

From B.E. work:

- Acherjee, B., **Maity, D.** and Kuar, A.S., 2020. Optimization of correlated and conflicting responses of ECM process using flower pollination algorithm. *International Journal of Applied Metaheuristic Computing (IJAMC)*, 11(4), pp.1-15.
- Acherjee, B., **Maity, D.** and Kuar, A.S., 2020. Ultrasonic machining process optimization by cuckoo search and chicken swarm optimization algorithms. *International Journal of Applied Metaheuristic Computing (IJAMC)*, 11(2), pp.1-26.
- Acherjee, B., **Maity, D.**, Prakash, S., Kuar, A.S. and Mitra, S., 2018. Optimal Process Parameter Selection of Underwater Nd: YAG Laser Micro-channeling on PMMA by Firefly Algorithm and Flower Pollination Algorithm. *Chinese Soc. Mech. Eng*, 39(5), pp.515-533.

Conference publications

From M.Tech work:

- Sharma, V.M., **Maity, D.**, Racherla, V. and Pal, S.K., 2018, June. Friction Sintering of Copper Powder Using a New Rapid, Cost Effective and Energy Efficient Process. In International Manufacturing Science and Engineering Conference (Vol. 51388, p. V004T03A008). American Society of Mechanical Engineers.

Conference attended

From PhD work:

- Study of diffusion mechanism in a friction processing technique for joining of copper and aluminium. Poster presentation at FEMS EUROMAT 2023.
- Feasibility investigation of a new friction processing-based joining technique for Ni-Al dissimilar metal welding. Oral Presentation at 13th International Symposium on FSW (ISFSW 2024).

Book chapters

From B.E. work:

- Acherjee, B., **Maity, D.**, Karia, D. and Kuar, A.S., 2019. Selection of laser micro-drilling process parameters using novel bat algorithm and bird swarm algorithm. In *Optimization Using Evolutionary Algorithms and Metaheuristics* (pp. 83-100). CRC Press.
- Acherjee, B., **Maity, D.**, Kuar, A.S., Mitra, S. and Misra, D., 2017. Optimization of laser transmission welding parameters using chicken swarm optimization algorithm: Chicken swarm algorithm optimization of laser transmission welding. In *Handbook of Research on*

Manufacturing Process Modeling and Optimization Strategies (pp. 142-161). IGI Global Scientific Publishing.

Teaching assistantship experiences

Coursework name	Level of course	Institute where TA was taken
Introduction to manufacturing processes (Welding Lab)	UG 1 ST Year	IIT Kharagpur
Introduction to manufacturing processes (Machining Lab)	UG 1 ST Year	IIT Kharagpur
Welding Lab (Analysis of heat flow)	UG 3 rd year	IIT Kharagpur
Mechatronics Lab	UG 2 nd year	IIT Kharagpur
Metrology Lab	UG 3 rd year	IIT Kharagpur
Finite element method (Theory course)	UG 4 th year + PG 1 st year	IIT Kharagpur
Numerical modelling of manufacturing processes (Theory course)	UG 4 th year + PG 1 st year	IIT Kharagpur
	UG 3 rd year & 4 th year	NIT Raipur
	UG 3 rd & 4 th year + PG 1 st year	JIS College of Engineering
Mathematical modelling of manufacturing processes	NPTEL	
Welding Metallurgy		
Fundamental of welding science and technology		
Advances in welding and joining technologies		

Declaration

I hereby declare that the aforementioned information is true to the best of my knowledge.

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Debanjan Maity,
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