MANUFACTURING ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

MANUFACTURING ENGINEERING

The Master of Technology program in Manufacturing Engineering was started in 1989. The program emphasizes fundamental principles of Manufacturing Engineering for various applications, including Materials Processing, Friction Stir Welding, Semi-Solid Processing of Composites, Thermal Spray Coatings, Severe Plastic Deformation, Advanced Materials Characterization, Micro-Machining, Laser Additive Manufacturing, and Nonconventional machining, etc. Students are also encouraged to do their projects in industries, wherever there are chances of exposure to various avenues in Manufacturing Engineering. The program has traversed the path of knowledge dissemination and generation and delivered efficient Manufacturing Engineering postgraduates to the nation.

VISION AND MISSION STATEMENT OF THE DEPARTMENT

VISION

To create globally competent mechanical engineers capable of working in an interdisciplinary environment, contributing to society through innovation, entrepreneurship, and leadership

MISSION

1) Produce Mechanical Engineers with a strong theoretical and practical knowledge to contribute to society with high moral and ethical values

2) Nurture students with a global outlook for a sustainable future and sound health.

3) Enable to be productive members of interdisciplinary teams, capable of adapting to changing environments of engineering, technology, and society.

4) Inculcate critical and deep-thinking abilities among students and develop entrepreneurial skills, innovative ideas, and leadership qualities.

5) Create facilities for continued education, training, research, and consultancy

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-1 Create globally competent manufacturing engineers with exposure to scientific and engineering aspects of product life cycle.

PEO-2 Enable graduates with strong fundamentals and usage of appropriate engineering tools.

PEO-3 Develop skills for integrated problem-solving, analysis and effective communication in a team-based environment

PEO-4 Create awareness of the societal impact and professional ethics

PROGRAM OUTCOMES (POs)

PO-1: An ability to independently carry out research/investigation and development work to solve practical problems.

PO-2: An ability to write and present a substantial technical report/document.

PO-3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

FACULTY (MANUFACTURING ENGG.)

Prasad Krishna (PhD-University of Michigan)
Professor (HAG), (On Deputation, Director NIT Calicut)
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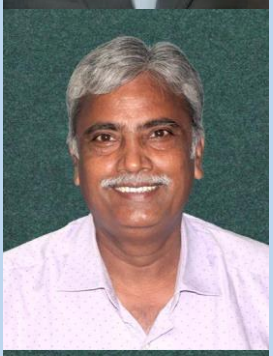

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COMPLETED R&D PROJECTS

1. FIST program on setting up of 'Composites Laboratory', Funding Agency: DST, Investigators: - S. M. Kulkarni and Vijay H. Desai.
2. Characterization of Tribological Properties of Polymer Composites Under Slider and Reciprocating Wear, Funding Agency: - MHRD, Investigator: - H. Suresh Hebbar.
3. Prototyping and Testing of bio-composites and composite lumber structural components, Funding Agency: MHRD, Investigator: - S. M. Kulkarni.
4. Investigation of machining characteristics of NiTi-based shape memory alloys using WEDM, Funding Agency: DST-SERB, Investigator: - S. Narendranath
5. Study of corrosion behaviour of Wrought Mg Alloys processed by Severe Plastic Deformation for Naval Applications, Funding Agency: NRB, Investigator: S. Narendranath
6. Development Of Composite Filament for Light Weight 3D Printed Components, Funding Agency: DST-TSDP, Investigator: - Dr. Mrityunjay Doddamani and Dr. Srikanth Bontha
7. Additive Manufacturing of Large Size Metal Components with Wire & Powder Hybrid Direct Energy Deposition (WP-DED) Process, Funding Agency: DST-CRG, Investigator: Dr. Srikanth Bontha

ONGOING R&D PROJECTS

Sl. No.	(Principal Investigator/ Coordinator	Project Title	Grant (INR) Lakhs	Funding Agency
1.	Dr. Mrityunjay Doddamani	An Investigation in to the Effects of Induced Helicity in The Carotid Bifurcated Arteries on Patient Specific Models	16.15	DST-SERB
2.	Dr. Sudhakar C Jambagi	Improvement In the Properties of Thermally Sprayed Hydroxyapatite Bio-Ceramic Coating Reinforced with Nanostructured Materials	38.4	DST-SERB
3.	Dr. A.S.S. Balan	Ultrafine Grain Refinement Through Low Plasticity Burnishing on WAAM of Mg alloy For Aerospace and Automotive Applications	16.01	SYST-SEED
4.	Dr. H Shivananda Nayaka	Experimental Technique to Induce Surface Grain Refinement Through Laser Shock Peening on ECAP Processed Mg Alloy.	41.02	DST-SERB
5.	Dr. Mrityunjay Doddamani	Pre-Operative Damage Assessment in Orthopedic Surgery Using 3D Printing to Minimize Healing Time	5.0	VGST-GOK

6.	Dr. Mrityunjay Doddamani	Cost-Effective Enhanced Insulating Foams for Cold Storage Application	30.62	ISHRAE
7.	Dr. Mrityunjay Doddamani	Additive Manufacturing of Novel Structural Foam Composites for Durability and Damage Tolerance	86.49	SPARC
8.	Dr. Srikanth Bontha	Laser-based Additive Manufacturing of Ni-based Superalloy Components: Advancing Repair and Enhancement Technologies Using LMD Technique - A Simulation and Experimental Validation	26.4	ISRO
9.	Dr. Ranjeet Kumar Sahu, Dr. Hemantha Kumar and Dr. Debashisha Jena	Synthesis of Intelligent Nanostructured Materials via a Plasma Source based Digital Nano- manufacturing: Method and their Characterization	30.27	DST-SERB
10.	Dr. P S Suvin, Dr. Nikhil and Dr. Arun D	Enhance lubricant performance in an electrical environment to overcome electrical bearing failures in EV	13.5	DST-SERB
11.	Dr. M. R. Ramesh, Dr. Sharnappa Joladarashi	Performance evaluation of HVAF sprayed NiAl intermetallic based composite coatings for aerospace repair and manufacturing applications	27.0	DST-SERB
12.	Dr. Srikanth Bontha, Dr. A.S.S. Balan	Laser Directed Energy Deposition of Functionally Graded Cu-SS316L structures for Power Generation applications	31.45	DST-SERB
13.	Dr. Srikanth Bontha, Dr. B. Rajasekaran	Assessing suitable additive manufacturing technology for processing Titanium Aluminide components with desired microstructures and high temperature properties for aeroengine applications	341.0	DFTM, DRDO
14.	Dr. Srikanth Bontha	Laser Additive Manufacturing of Novel and High-performance Ni-based Superalloy Composites	44.08	SPARC
15.	Dr. Ranjeet Kumar Sahu, Dr. Saurabh Chandraker	Design and Development of Hybrid-FRP based Composites for Low-cost and Sustainable Mobile Shelter Houses.	48.35	DST-SYST

PROMINENT PUBLICATIONS

Sl. No.	Title	Journal	Author(s)
1.	Influence of wire-electric discharge machining process parameters on surface integrity of Ni-rich Ni-Ti-Hf alloys	Engineering Research Express (2023): doi: 10.1088/2631-8695/acdb32	Balaji V, Narendranath S
2.	Characterization of Inconel 625-SS 304 Weldments Developed by Selective Microwave Hybrid Joining Technique for Promising Applications	Journal of Materials Engineering and Performance (2023): doi: 10.1007/s11665-023-08390-7	Devendra L. Kamble, Ranjeet Kumar Sahu and S. Narendranath

3.	Optimization of wire-EDM process parameters for Ni-Ti-Hf shape memory alloy through particle swarm optimization and CNN-based SEM-image classification	Results in Engineering (2023): doi:10.1016/j.rineng.2023.101141	Rahul V. M, Balaji V, and Narendranath S
4.	MOGA and TOPSIS-based multi-objective optimization of wire EDM process parameters for $Ni_{50.3}$-$Ti_{29.7}$-Hf_{20} alloy	CIRP Journal of Manufacturing Science and Technology (2023): doi: 10.1016/j.cirpj. 2023.09.005	Balaji V, Narendranath S
5.	Effect of Multi-directional Forging on the Evolution of Microstructural and Mechanical Properties of Lightweight Al-Cu-Li Alloy AA2050	Journal of Materials Engineering and Performance (2023): doi:10.1016/j.rineng. 2023.101141	Jagadeesh, C., Shivananda Nayaka H., Ramesh, S, Praveen, T. R
6.	Multi-Response Optimisation of End Milling Process Parameters	Journal of Mines, Metals & Fuels (2023): doi:10.18311/ jmmf/2023/33352	Rao, B. Srinivasa, Ch Kanna Babu, and H. Shivananda Nayaka
7.	Investigation of microstructure and mechanical properties of Cu-Ni alloy processed by equal channel angular pressing	Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science (2023): doi: 10.1016/j.surfcoat.2023. 129809	Sachin, S., and Shivananda Nayaka H.
8.	Elevated temperatures erosion wear behavior of HVOF sprayed WC-Co-Cr/Mo coatings on Ti6Al4V substrate	Surface and Coatings Technology (2023): doi: 10.1016/j.surfcoat.2023.1290	Netrananda Behera, Subba Rao Medabalimi, and M.R. Ramesh
9.	Microstructure, mechanical and wear properties of SiC and Mo reinforced NiCr microwave cladding	Advances in Materials and Processing Technologies (2023): doi: 10.1007/s40033-022-00445-8	Sharanabasava, H, Raviprakash, M, Prasad, C. D, Ramesh, M. R, Phanibhushana, M. V, Vasudev, H and Kumar, S
10.	High temperature erosion performance of NiCrAlY/Cr_2O_3 /YSZ plasma spray coatings	Transactions of the IMF (2023): doi:10.1080/00202967. 2023.2208899	Reddy G. M. S, Prasad C. D, Shetty G, Kakur, N, and Ramesh, M. R.
11.	Influence of friction stir processing on microstructure, mechanical properties and corrosion behaviour of Mg-Zn-Dy alloy	Journal of Materials Science (2023): doi:10.1007/s10853-023-08208-w	Rokkala,U., Bontha,S., Ramesh M.R., Balla, V.K.
12.	Effect of deposition strategy and post processing on microstructure and mechanical properties of serviced Inconel 625 parts repaired using laser directed energy deposition	Optics and Laser Technology (2024): doi: 10.1016/j.optlast. 2023. 109831	Chaurasia J.K., Jinoop A.N., Paul C.P., Bindra K.S, Balla V.K., Bontha S.
13.	Effect of Build Orientation on Anisotropy in Tensile Behavior of Laser Powder Bed Fusion Fabricated SS316L	Journal of Materials Engineering and Performance (2023): doi: 10.1007/s11665-023-08490-4	Thanumoorthy R.S., Chaurasia J.K., Anil Kumar V., Pradeep P.I., Balan A.S.S., Rajasekaran B., Sahu A., Bontha S.

14.	Effect of CMT-WAAM Process Parameters on Bead Geometry, Microstructure and Mechanical Properties of AZ31 Mg Alloy	Journal of Materials Engineering and Performance (2023): doi: 10.1007/s11665-023-08498-w	Manjhi S.K., Sekar P., Bontha S., Balan A.S.S.
15.	Effect of equiaxed grains and secondary phase particles on mechanical properties and corrosion behaviour of CMT- based wire arc additive manufactured AZ31 Mg alloy	CIRP Journal of Manufacturing Science & Technology (2023): doi:10.1016/j.cirpj.2023.07.08	Manjhi, S.K., Sekar, P., Bontha, S and Balan, A.S.S.
16.	Factors influencing powders' flowability and favorable phases like crystalline (Mullite and quartz) and amorphous phases of plasma-sprayed fly ash coatings suitable for marine and offshore applications	Advanced Powder Technology (2023): doi: 10.1016/j.apt. 2023.104150	Bhajantri, Vishwanath F., and Sudhakar C. Jambagi.
17.	An Investigation into the Relative Efficacy of High-Velocity Air-Fuel-Sprayed Hydroxyapatite Implants Based on the Crystallinity Index, Residual Stress, Wear, and In-Flight Powder Particle Behavior	Langmuir (2023): doi: 10.1021/ acs.langmuir.3c02840	N Jagadeeshanayaka, Shubham Nitin Kele, and Sudhakar C. Jambagi
18.	Optimisation of process parameters for dimensional stability in FDM	Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering (2023) doi: 10.1177/095448923120680	Sahu, Jitendra Kumar, Ranjeet Kumar Sahu, Jitendra Kumar Katiyar, and P. Sai Kiran.
19.	MOJAYA Coupled with R-method for Optimization of Machining Parameters Used in the Generation of Micro Holes on GFRP Composite Using an In-House Developed µ-ECDM System	Advanced Engg Optimization Through Intelligent Techniques: Select Proceedings of AEOTIT 2022. Singapore: Springer Nature Singapore, (2023): doi: 10.1007/ 978-981-19-9285-8_8	Bhargav, K. V. J., P. Shanthan, P. S. Balaji, and Ranjeet Kumar Sahu
20.	Generation of microchannels on PMMA using an in-house fabricated µ-ECDM system	International Journal of Materials Research (2023): doi:10.1515/ ijmr-2022-0089	KVJ, Bhargav, Balaji PS, and Ranjeet Kumar Sahu.
21.	A study on the effect of process parameters and scan strategies on microstructure and mechanical properties of LDE deposited IN718	Journal of Materials Processing Technology (2023): doi: 10.1016/ j.jmatprotec.2023.118096	Thanumoorthy, R.S., Sekar, P., Bontha, S. and Balan, A.S.S.
22.	Evaluation of functionally graded YSZ - IN625 clad without bond coat using laser directed energy deposition	Materials Letters (2023): doi: 10.1016/j.matlet.2023.135012	Likhwar, J., Thanumoorthy, R.S., Bontha, S. and Balan, A.S.S.
23.	Hybrid additive manufacturing of ER70S6 steel and Inconel 625: A study on microstructure and mechanical properties	Materials Today Communications (2023): doi: 10.1016/j.mtcomm. 2023.106977	Rodrigues, J.P., Thanumoorthy, R.S., Manjhi, S.K., Sekar, P., Perumal, D.A., Bontha, S. and Balan, A.S.S.

24.	An Experimental Investigation on Microstructure, Mechanical Properties and Corrosion Performance of CMT-Wire Arc Additively Manufactured Al-4043 Alloy	Transactions of the Indian Institute of Metals (2023): doi: 10.1007/s12666-023-02965-7	Manjhi, S.K., Kumar, B.S.S., Rodrigues, J.P., Sekar, P., Bontha, S. and Balan, A.S.S.
25.	Investigating the Wettability, Rheological, and Tribological Properties of Ammonium-Based Protic Ionic Liquids as Neat Lubricants for Steel–Steel and Steel–Aluminium Contacts	Lubricants (2023): doi: 10.3390/ lubricants11110469	Patro, B.D.K., Suvin, P.S., Kreivaitis,R & Gumbytė M.
26.	Micro-tribological Characteristics of Ti6Al4V Alloy Subjected to Shot Blasting Surface Treatment Process	Transactions of the Indian Institute of Metals (2023): doi: 10.1007/ s12666-023-02915-3	John, A., Showket, J, Joseph Babu, Edachery, V. and Suvin, P.S.

MAJOR FACILITIES	MAJOR LABORATORIES
➢ 25-ton Hydraulic Press ➢ CAD Lab ➢ **Software:** AUTOCAD, ANSYS, ADAMS, DEFORM, EES, NIST-REFPROP, SIMPACK ➢ Injection Molding Equipment ➢ Pin on Disc wear testing Machine ➢ Universal Tensile Testing Machine ➢ Vickers Microhardness Tester ➢ Vacuum Arc Melting Furnace ➢ Wire-Electric Discharge Machine ➢ Microwave Welding Furnace ➢ Rolling Machine ➢ Electro Chemical Corrosion Setup ➢ Optical Microscope ➢ Muffle Furnace ➢ Laser Shock Peening ➢ Ball Burnishing	❖ Machine shop I & II ❖ CAD/CAM laboratory ❖ CNC Machine Tools Laboratory ❖ Materials characterization laboratory ❖ Metrology Laboratory

BOOKS PUBLISHED

Sl. No.	Title	Journal	Author(s)
1.	Corona Discharge Micromachining for the Synthesis of Nanoparticles: Characterization and Applications	1st Edition, Print ISBN -9780367224738; eBook ISBN – 9781000065404, doi: 10.1201/9780429275036, CRC Press, Taylor & Francis, Boca Raton, New York, 2019.	R.K Sahu, Somashekhar S. Hiremath
2.	Modern Manufacturing Technology: Spotlight on Future	1st Edition, Print ISBN – 9781032066394; doi:10.1201/97 CRC Press, Taylor & Francis, Boca Raton, New York, 2021.	Katiyar J.K, R.K. Sahu

PATENTS GRANTED

Sl. No.	Title	Issue Date	Author(s)
1.	Method for Generation of Nanoparticles using Advanced Mechanical Micro-Machining Technique	4294/CHE/2014, Awarded on September 29, 2020.	Ranjeet Kumar Sahu, Somashekhar S. Hiremath
2.	Cutting Tool with Error Proofing Feature	US 2011/0076106 A1, Awarded, March 31, 2011	Morrison, G.M., Bontha, S., Seculi, J., Long, T.J., Verellen, J.J., and Iyer, R
3.	Cutting Tool Having Coolant Delivery System for Providing Cutting Fluid in a Fan-Like Pattern	US 2010/0239377, Awarded, September 23, 2010	Morrison, G.M., and Bontha, S
4.	Double-Sided Ball End Mill Cutting Insert and Tool.	US 2010/0124465 A1, Awarded, May 20, 2010	Morrison, G.M., and Bontha, S
5.	Method And System for Fabricating a Metallic Continuous Reinforced Composite	468811, Awarded, November 14, 2023	Praveen T R, and H Shivananda Nayaka

CONSULTANCY POTENTIAL

- Analysis of Machining Processes (turning, milling, grinding, and other Non-traditional Machining processes)
- Solidification Processing
- Metal Additive Manufacturing
- Computer-Aided Modelling and Analysis
- Surface Metrology and Instrumentation
- Error compensation of CNC Machines
- Micro Manufacturing
- Wear and Tribological Studies
- Repair, Re-manufacturing, and Surface modification

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