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Mechanical Engineering Faculty Search Committee

Department of Mechanical Engineering, Mississippi State University,

Starkville, MS 39762

To Faculty Search Committee/Department Head,

I am writing to express my strong interest in the Assistant Professor position in the Department of Mechanical Engineering at Mississippi State University. With over eight years of focused research in solid-state manufacturing processes, and substantial teaching experience, I am excited about the opportunity to contribute to your department's mission in education and innovation.

Currently, I am a Postdoctoral Researcher in the Department of Materials Science and Engineering at Virginia Tech, working with Prof. Hang Yu. My research centers on **Additive Friction Stir Deposition (AFSD)**, a solid-state additive manufacturing process. Prior to this, I completed my Ph.D. in Mechanical Engineering at IIT Bombay under the supervision of Prof. Amber Shrivastava. My doctoral research investigated **Friction Stir Welding (FSW) of dissimilar materials**, combining both computational and experimental methodologies to understand and predict microstructure evolution and interfacial phenomena.

My research employs advanced multi-physics modeling techniques. During my Ph.D., I developed a **3D CFD-based thermo-mechanical model** using MATLAB to simulate dissimilar FSW. This model was further extended to incorporate **Fick's second law of diffusion** and **Gibbs free energy calculations** for predicting the formation and growth of intermetallic compounds. These simulations were validated using a suite of microstructural characterization techniques, including

SEM, EBSD, EDS, and X-ray tomography, applied to Al1050–Cu, Al6061–AZ31Mg, and SS304–Ti joints. At Virginia Tech, I continue this research direction by developing and validating CFD-based models for AFSD to map material flow paths and thermo-mechanical history.

My teaching interests lie broadly in **manufacturing processes, materials science, and metallurgy**. During my time at IIT Bombay, I served as a Teaching Assistant for courses in manufacturing processes and led lab sessions as the Head TA for the manufacturing practice course. I was responsible for preparing and evaluating lectures, tutorials, and exams, and delivering hands-on training in CNC machining. These experiences have shaped a teaching philosophy grounded in active learning, conceptual clarity, and practical application.

I am particularly enthusiastic about the opportunity to contribute to Mississippi State University's strengths in mechanical design and manufacturing. I believe my background in solid-state processing, numerical modeling, and microstructural characterization aligns well with your department's goals. I am eager to build a research program that integrates experimental and computational approaches to address emerging challenges in manufacturing science while fostering student engagement through inclusive and application-driven teaching.

Enclosed are my curriculum vitae, teaching statement, and research statement for your review. Thank you for considering my application. I look forward to the possibility of contributing to your department and welcome the opportunity for an interview.

Sincerely,
Nikhil Gotawala