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# Motivation Letter

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*Amrith Krishnan, admitted to MSc Mechatronics at FH Aachen*

Since senior schooling, my aspiration has always been mechanical engineering, cultivated through numerous factory visits and science competitions. This motivation and continued efforts enabled me to clear one of India's most challenging entrance examinations and join BITS Pilani Hyderabad Campus, an Institute of Eminence as declared by the Government of India.

My first research experience was an experimental project on the mechanical and electrochemical properties of thermomechanically processed Nickel-Titanium alloy. Along with mechanical tests, electrochemical evaluation of the material using Nyquist and Bode plots was performed to study its corrosive nature. The project culminated with the acceptance of this research article in Volume 26 of Materials Today Communications. As part of the course curriculum, a project on design and manufacturing of miniature lathe equipped with motion sensors and electronic controls was undertaken by me. This introduced me to the field of modelling and simulation of mechatronic systems. The successful completion of manufacturing and testing of the miniature lathe kindled my interest in designing systems and persuaded me to take another project on simulation of 3D printed composites in the subsequent semester. The simulations to obtain the fracture energy of twelve composites with different printing properties were performed to determine the optimum printing parameters for high strength application. These three projects gave me an insight into academic research and its applications.

Having prior industrial training in the assembly and testing of blast hole drills and a two-month internship at ZF Wind Power (a unit of ZF Friedrichshafen) in quality control and data logger software implementation, I decided to do an internship in a manufacturing industry on new product development. I secured an internship for summer 2020 at Harsha Engineering Pvt Ltd, an original equipment manufacturer and was tasked with developing a 3D model of a mini-excavator digging structure in two months as part of their new product development.

Considering my contribution to the modelling of excavator structure, I was offered a five-month thesis on the design of hydraulic and control systems along with structural analysis. I learned and applied the concept of design for manufacturing while working on designing and performing structural calculations. A new concept was implemented to electronically control the engine throttling based on the pressure feedback signal from hydraulics, as required by the site working conditions. Furthermore, a system was devised to initiate an audio-visual alarm in case of hydraulic line clog based on the signal from differential pressure indicator and

engine cutoff was programmed. Working with an industrial organization allowed me to understand the process of integrating mechanical and electronics concepts.

In the next phase of the thesis, a techno-commercial feasibility study for an electric-powered mini-excavator was performed. The module started off with selecting a suitable electrical drive to run the hydraulics and subsequently moved on to controllers and battery selections. Working on the development of an electric mini-excavator gave me a detailed insight into the EV domain. The project consisted of technical calculations for the electrical components and financial calculations to verify the feasibility of the project. Being the first of its kind in India, the economic feasibility of introducing it in the market was given a significant weightage.

After completing my thesis, I continued at Harsha Engineering as an intern for six weeks and developed a steering design for an electric wheelbarrow. These twelve months of working in the industry gave me a multifaceted experience involving technical calculations, component selection, and financial calculations and broadened my knowledge immensely. This multidisciplinary experience gave me a firm idea of what is expected from an engineer in new product development and cemented my decision to continue for higher studies.

The field of Mechatronics goes hand in hand with product development. A post graduation in Mechatronics would greatly facilitate the improvement of my technical proficiency. I selected my destination as Germany for post graduate studies owing to the fact that it is one of the leading countries for Automotive as well as heavy machine industries. I firmly believe that the skills acquired during my undergraduate studies and my passion for mechatronic system design make me a suitable candidate for the Master's course in Mechatronics. Having an understanding of the topics of design, materials and simulation of mechatronic systems will give me a head-start in pursuing the Master's course and help me conceptualize and design electromechanical systems. With a great emphasis on a practical approach to education, the MSc Mechatronics course at FH Aachen would enable me, as a mechatronics engineer, to contribute significantly to the existing mechatronics and automotive sectors.