

Statement of Purpose (SOP)

My passion for electronics and communication engineering has ignited my growing understanding of technological advances around me. This transition's unbelievable pace inspired me to continue my studies and become a part of this fascinating sector. I've always been curious about how things work, but my undergraduate experience opened my eyes to the curiosity and broader benefits of research. I studied various subjects like Signal and System, Digital Signal Processing, Image Processing, Electronics Devices, Programming, Communication, and Embedded System, etc., and enjoyed them thoroughly during my graduate coursework. I had the opportunity to do research which motivated me to pursue higher studies. I have been avid amateur science, enthusiastic and passionate student, so I'd like to blend my research with the opportunity to explore the surrounding environment.

Photonics plays a vital role in almost all life domains: the manufacturing sector to life sciences, healthcare, safety and security, and imaging, lighting, and engravings. The study finds its application in various fields, including medicine, telecommunications, information processing, metrology, military technology, visual arts, robotics, and agriculture, among many others. Despite all of this, the demand for new integrations of technology continues to grow, and recent advances in photonics must keep pace with this increase in global Infrastructure. Terahertz photonic systems remain a global stronghold and now move to the fields of medical, defense and terabit/sec data communications as well as science. Graphene has come to light in recent years as an almost ideal material for aperiodic grating manufacturing on these THz lasing units. Graphene is strongly conducting, nearly translucent and provides highly effective evanescent coupling: it has all the material properties needed to provide the wave-length tuning for plasmonic interactions.

My interest in Electronics Engineering stem from the need for higher processing capabilities for photonics. I have cultivated a deep interest in developing a new-tier system capable of bridging the gap between innovation and technical methodology. I believe a higher studies in photonics will allow me to continue to develop an understanding based on photonics, algorithms, and structures, allowing me to further research in the field that will drive new technologies. The project **Nanomaterial based tunable quantum terahertz opto-plasmonic smart sensing chips** aim to establish such an interpretation on the development of tunable graphene smart sensing chips for Terahertz Optoelectronic and plasmonic applications and new synthetic methodologies. Also,

mainly interested in Opto-electronics, Semiconductor device, Sensors, Nanomaterial, Energy Devices, Machine Learning in Sensors Interface, Electronics Terahertz semiconductor laser, Graphene, QCL, Opto-Terahertz and etc. The predicted outcomes include the active and passive optical photonic crystal elements are planned to integrate the Opto-plasmographic terahertz chips with the QCL, offering high complexity. An important photonic network and information processing create the most efficient and flexible terahertz-frequency quantum platform to allow opto-plasmonic integration to be scaled at high density. So far, I've enjoyed my undergraduate work, but I think I will contribute more as an independent researcher. My current academic and professional work demonstrates an ability to put forward ideas clearly and concisely.

Besides the core study, I have been involved in computer coding since I was in high school, and I have just learned a handful of the primary programming languages such as SQL, HTML, and C. During my undergraduate studies, I worked on various projects that needed basic to advanced coding skills. I also worked on various software and applications like MATLAB, AutoCAD, Xilinx, LTspice, Origin Pro, Silvaco TCAD, and MS Office, which needed deep analytics skills for my project. Many of my most recent publications reflect my logical and rational reasoning skills. My programming skills include C, C++, XML, Java, DBMS, SQL and HTML etc.

During the COVID-19, I have collaboratively work with professors on the project entitled "Computer aid screening of COVID-19 using X-ray and CT scan images: An inner comparison". This study's objective was to conduct a critical analysis to investigate and compare a group of computer aid screening methods of COVID-19 using chest X-ray images and computed tomography (CT) images.

As an undergraduate researcher, I had the opportunity to participate in a multidisciplinary project integrating the areas of Electronics, Bio-photonics, Signal Processing, Machine Learning, Image Processing, and Deep Learning. I have a great passion for innovation, prototyping, and research. As an undergraduate student, I have been a part of various technical and extracurricular endeavors. I have published more than 11 research articles in refereed International Journals and Conferences; more than 5 research articles were accepted or under review. Besides, I have a patent on the Australian Innovation Patent. I have recently been awarded the "Best Research Paper Presentation Award" in the 4th International Conference on Recent Trends in Communication & Electronics (ICCE-2020) organized by KIET Group of Institutions Delhi-NCR Ghaziabad, India. My

commitment to research and writing skills makes me well qualified to perform the work and meet the challenges of fundamental research and applied problems in a wide range of Electronic Engineering areas. With the interdisciplinary approach and good command of the English and Hindi language, I have approached field problems differently as I possess excellent communication skills.

I would relish the opportunity to such a prestigious and forward-thinking organization, “**IIT KHARAGPUR - UNIVERSITY OF MANCHESTER**,” which encourages researchers, students, academia, and scientists to grow personally, professionally, and philosophically. IIT Kharagpur - University of Manchester has various s departments, research centers, and schools led by highly qualified and experienced professors. **Dr Prasanta Kumar Guha’s** work in Opto electronics, Semiconductor device, Sensors, Nanomaterial and **Dr Subhasish Chakraborty’s** work in Terahertz semiconductor laser, Graphene, QCL, Opto-Terahertz which perfectly matches with the area of my interest and passion. Lab Infrastructures will strengthen my basics. Joining this great institution will open doors of learning opportunities for me. I will be praised for being a part of the team that fosters that mission under an experienced professor’s guidance. If I can pursue my research work at IIT Kharagpur - University of Manchester, I will do purposeful research focusing on solving real-world problems. I hope to be part of this excellent institute.