Arpan Sur

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Education

M.Sc. in Electrical and Electronic Engineering (EEE) — June 2023–June 2025 (Expected)
Bangladesh University of Engineering and Technology (BUET) — Dhaka, Bangladesh
- CGPA: **3.92**/4.00

B.Sc. in Electrical and Electronic Engineering (EEE) — April 2018–May 2023
Bangladesh University of Engineering and Technology (BUET) — Dhaka, Bangladesh
- CGPA: **3.53**/4.00

Research Interests

- Plasmonics
- Ultrafast Optoelectronics
- Nanophotonics
- Quantum Optics
- Integrated Optics
- Nonlinear Optics

Research Experience

Research Fellow
Nov 2023 – Ongoing

Improvement of thin film perovskite solar cells beyond the visible spectrum
Supervisor: *Dr. Ahmed Zubair, Professor, Department of EEE, BUET*
- Studied the structural dependence of near-field and far-field enhancement by plasmonic nanoparticles (NPs) embedded in an ultrathin perovskite absorber layer, while excluding the parasitic absorption of NPs. Presented my findings on high-surface-area nanoparticles at the 85^{th} *JSAP Autumn Meeting 2024*.
- Analyzed the impact of implementing a hyperuniform nanohole pattern in the top layer and absorption layer of perovskite solar cells.

Ultra-compact dielectric-coated graphene based integrated device
Supervisor: *Dr. Ahmed Zubair, Professor, Department of EEE, BUET*
- Investigated the surface plasmon polariton modes and their propagation through graphene at various chemical potential in the MIR to THz frequency range.
- Designed an ultra-compact graphene plasmonic logic gate operating at the MIR wavelength, capable of performing both AND and OR operations based on the applied voltage.

Research Student
Aug 2024 – Ongoing

2D material-based nanostructure design for photothermal cancer therapy
Supervisor: *Dr. Md. Kawsar Alam, Professor, Department of EEE, BUET*
- Investigated multifunctional nanostructures with superior thermal and optical absorption properties in the NIR spectrum through first-principles and FDTD simulations.

Undergraduate Researcher
May 2022 - May 2023

Collaborative multi-robot coverage path planning and target search system
Supervisor: *Dr. Md. Farhad Hossain, Professor, Department of EEE, BUET*
- Evaluated the efficiency of various coverage and exploration algorithms, considering the kinematic and dynamic constraints of both vehicles and sensors.
- Conducted coverage path planning based exploration of the search space through communication between deployed robots and search targets, accounting for path loss models.

Publications Under Review and Preparation

S. Saha*, A. Sur*, L. Saha, M. K. Alam, *"NIR-I Responsive 2D $MoGe_2P_4$ for Targeted Photothermal Tumor Therapy"*. **Manuscript submitted to ACS Applied Nano Materials.** (2024)

A. Sur, A. Zubair, *"Ultra-Compact Voltage-Controlled Dielectric-Cladded Graphene Plasmonic Waveguide Based Optical Logic Gate"*. **Manuscript submitted to 13^{th} IEEE ICECE.** (2024)

S. Saha*, A. Sur*, S. Bain, T. T. Hasan, *"Development of a Low-Cost Spectrometer for Educational Applications"*. **Manuscript submitted to 13^{th} IEEE ICECE.** (2024)

Academic Projects and Technical Writings

Design of a Bangla Calendar Clock [Demonstration] Sept 2022
- Developed a clock displaying time and date in Bangla language with internet time synchronization.

Design of a Spectrometer Operating in Visible Wavelength [Presentation] Feb 2023
- CD grating and low-cost camera assisted spectrometer was developed to characterize light sources by inspecting their intensity-wavelength and light-current characteristics in the visible region.

Self-consistent Schrodinger-Poisson Solver for Double-gate MOSFET [Report] Aug 2023
- Numerically computed potential profile, band-structure and C-V characteristics using MATLAB.

Investigation of Ternary Barrier Layers in GaN-Based HEMT Devices [Report] Sept 2023
- Invetigated the 2DEG concentration of InAlN/GaN and ScAlN/GaN interface using BandEng.

Review on Material Platform for Integrated Single Photon Detector [Report] Oct 2023
- Studied the working principle of single photon detector (SPD) and conducted a literature survey on widely adopted SPD technologies (SNSPD, SPAD and TES) on different potential material platforms.

Review on Impact of Graphene and its Derivatives Photovoltaic Application Feb 2024
- Reviewed the functionality of Graphene and its derivatives in different layers of various third generation solar cells.

Implementation of a Movie Recommendation System [Report] Mar 2024
- Developed a recommendation system using *MovieLens* dataset with the PyTorch framework.

Technical Skills

Languages: C/C++, MATLAB, Octave, Python Toolbox (MEEP, MPB, Qiskit, PyTorch), ARMv7, Verilog

Simulation Tools: Ansys Lumerical (FDTD, MODE, CHARGE, HEAT), COMSOL Multiphysics, Material Studio, Quartus, Proteus, PSpice, Cisco Packet Tracer, CoppeliaSim, Webots, AutoCAD, PCB design

Microcontroller and Microprocessor: STM32L47x, ATmega328P, Xtensa LX6

Scientific Writing, Graphics and 3D Modelling: LaTeX, Origin, MS Office, Blender, Adobe Illustrator

Honors and Awards

Postgraduate Research Fellowship, BUET [Office Order] Nov 2023–Apr 2025
- Selected as one of the top 6 research proposals from Department of EEE

RISE Student Research Grant, BUET [Certificate] Aug 2022–Aug 2023
- Selected among 155 undergraduate student research proposals.

EEE Faculty Dean's List Award, BUET 2022–2023
- For obtaining a GPA of 3.75 or above in two regular terms of an academic year.

Professional Experience

Research Fellow Nov 2023–Present
Department of EEE, BUET

Relavant Coursework

Undergraduate Courses
- Optoelectronics
- Optical Communication
- Solid State Devices
- Engineering Electromagnetics

Postgraduate Courses
- Heterostructures and Compound Semiconductor Devices
- Nanophotonics and Plasmonics
- Quantum Computing and Quantum Photonics
- Nanoscale Device Modeling and Simulation Techniques
- Laser Theory
- Machine Learning and Pattern Recognition