

Md. Raisul Islam Rifat

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Chittagong, Bangladesh

EDUCATION

• Bachelor of Science in Electrical and Electronic Engineering

Chittagong University of Engineering and Technology

◦ CGPA: 3.48/4.00; Rank: 36th

August 2025

Chittagong, Bangladesh

• Higher Secondary Certificate

Chittagong College

◦ GPA: 5.00/5.00

May 2019

Chittagong, Bangladesh

• Secondary School Certificate

Nasirabad Govt. High School

◦ GPA: 5.00/5.00

March 2017

Chittagong, Bangladesh

PUBLICATIONS

C=CONFERENCE, J=JOURNAL

- [J.1] **QSAC: Quantum-assisted Secure Audio Communication using Quantum Entanglement, Audio Steganography, and Classical Encryption.** (*Published in Engineering Science and Technology, an International Journal [Q1, IF: 5.4]. Article reference: JESTCH_102167*)
Md. Raisul Islam Rifat, Md. Mizanur Rahman, Md. Abdul Kader Nayon, Md Shawmoon Azad and M.R.C. Mahdy.
 - Designed a novel scheme of secure audio communication by incorporating **E-91** Quantum Key Distribution with **SHA-3** Hashing Algorithm, **ChaCha20-Poly1305 AEAD** and **LSB** steganography.
 - Implemented **entanglement-based** key generation with SHA-3 hashing and validated security using the **CHSH** inequality to detect eavesdropping.
 - Engineered an LSB-based audio steganography module to **embed** and reliably **extract** secret audio while maintaining **audible imperceptibility** through constrained sample-level modification.
 - Achieved high cryptographic robustness, demonstrating near-maximum **entropy** (15.9984), high **UACI** (49.9977%) and **NSCR** (99.9985%), and low **correlation** (1.4627×10^{-5}) in encrypted audio signals.
 - Ensured **end-to-end confidentiality, integrity, and authenticity** through authenticated encryption and steganographic concealment.
- [J.2] **Detection of Hallucination in Multimodal Large Language Models Across the Modalities: A Comprehensive Review.** (*In Preparation.*)
Md. Mizanur Rahman, Md. Raisul Islam Rifat.
 - Systematically analyzed **hallucination detection benchmarks for multimodal LLMs** across **text, image, audio, and video**, identifying critical gaps in existing literature related to audio and video modalities.
 - Developed a novel taxonomy to categorize and analyze over **50 benchmarks**, including over **10 benchmarks** for audio and video addressing a critical gap in existing literature, focusing on text and image hallucinations.
 - Compiled and analyzed key benchmarks attributes (e.g. dataset size, task type, evaluation metrics) across **4 detailed tables**, facilitating direct comparison and offering researchers valuable insights to guide the development of more robust MLLMs and effective mitigation strategies
- [C.1] **Design of a Negative Refractive Index THz Metamaterial Biosensor For Cancer Cell Detection.**
(Accepted and presented at **EICT, 2025**. Awaiting publication in **IEEE Xplore**.)
Md. Abdul Kader Nayon, Md. Raisul Islam Rifat, Nipa Dhar.
 - Designed a **non-invasive Biosensor** capable of detecting **Cancer Cells** by utilizing the **Negative Refractive Index of Double Negative Metamaterials** in the **THz** region.
 - Conducted full-wave **THz electromagnetic simulations** of the biosensor made up of **rectangular, orthogonal SRRs** on an **FR4 substrate** in **CST Microwave Studio** (0.5–2.0 THz).
 - Retrieved and analyzed **effective constitutive parameters** ($\epsilon_{\text{eff}}, \mu_{\text{eff}}, n_{\text{eff}}$), confirming **simultaneous negative permittivity and permeability** over the 0.6–1.8 THz band.
 - Quantified biosensing performance via **resonance shift, sensitivity** (≤ 0.4125 THz/RIU), **Q-factor** (≤ 12.64), and **Figure of Merit** (≤ 3.30).
 - Demonstrated **cell-type discrimination** (normal vs. cancerous cervical, blood, breast, and skin cells) through **spectral redshift** and **refractive index analysis**.

RESEARCH EXPERIENCE

- **Familiarization with Quantum Computing, Quantum Key Distribution & Post-quantum Cryptography.** 2024-2025
Supervisor: M.R.C Mahdi, Department of Electrical and Computer Engineering, North South University, Bashundhara, Dhaka [Q]
 - Learned about Quantum Matrix Mechanics and implemented BB84, B92 and E91 Quantum Key Distribution protocols as well as Quantum-safe Cryptography schemes such as Lattice-based cryptography using QISKit SDK.
- **Design of a Negative Refractive Index THz Metamaterial Biosensor for Cancer Cell Detection** 2024-2025
Supervisor: Nipa Dhar, Assistant Professor, Chittagong University of Engineering and Technology [Globe]
 - Learned about the Negative Refractive Index property of metamaterials and attempted to implement this property in THz frequency range using CST Microwave Studio.

INTERNSHIP EXPERIENCE

- **Bangladesh Telecommunications Company Ltd. (BTCL)** *24th November, 2024 - 12th December, 2024*
BTCL Regional Exchange, Nandakanon, Chattogram [Globe]
 - Participated in a 15-day long internship training program hosted by BTCL as part of the academic curriculum.
 - Studied carrier-grade telecommunication systems, including PSTN and GPON-based access networks, and IMS-controlled voice transmission architecture.
 - Analyzed national internet service infrastructure, covering IIG-BRAS-AAA workflow, cache and NIX servers, and router-switch hierarchy in ISP operations.
 - Gained exposure to optical transmission technologies, including PDH/SDH/DWDM systems, single-mode vs multimode fiber, and wavelength windows used in long-haul communication.

KEY PROJECTS

- **Capacitance Meter Design Project: Made a functioning Capacitance Meter using PIC 16F628A.** 2023
Tools: MikroC Pro, PICKit, Proteus [Q]
 - Developed a **digital capacitance meter** using the **PIC16F628A** microcontroller, capable of measuring capacitors in the **1 nF** to **1 µF** range, leveraging built-in analog comparators and TIMER2 module for precise measurements.
 - Implemented a method to **charge a capacitor through a series resistor** and calculate capacitance based on the **time to reach a defined voltage threshold**.
 - Verified functionality through **simulation on Proteus** and fabricated a **PCB prototype**, demonstrating practical system integration.
 - Evaluated the system's **accuracy** and **reliability**, providing a cost-effective and versatile tool for electronic testing and educational purposes.
- **Machine Design Project: Designed a 470 kVA, 6.6 kV/415 V, 3-Phase Distribution Transformer.** 2023
Tools: AutoCAD Electrical, MATLAB [Q]
 - Designed a 3-phase, 50 Hz distribution transformer with high-voltage tap settings of $\pm 2.5\%$ and $\pm 5\%$ and self-oil cooling (Oil Natural Air Natural(ONAN)).
 - Ensured **temperature rise over oil below 60°C** and **load loss limited to 6 kW**, meeting design specifications.
 - Calculated **percentage impedance ($\%Z = 4.5\%$)**, and evaluated **efficiency at full load, 75% load, and 50% load** under unity power factor.
 - Assessed **voltage regulation at full load** for both **unity** and **0.8 lagging power factor**, verifying reliability.
 - Integrated **electrical and thermal design considerations** to develop a practical, functional distribution transformer suitable for power distribution applications.
- **Heart Rate Sensor Design Project: Made a functioning Heart Beat Sensor using Arduino Uno vR3.** 2022
Tools: Arduino, C++, Proteus [Q]
 - Designed and implemented a **microcontroller-based biomedical monitoring system** for real-time heart rate (BPM) measurement using **photoplethysmography (PPG)** principles.
 - Developed an **end-to-end sensing pipeline** using the **MAX30102 pulse sensor** and **Arduino Uno**, including signal acquisition, basic conditioning, and BPM computation.
 - Performed **software-level validation and debugging** through **Proteus simulation**, integrating Arduino firmware and virtual instrumentation (LCD and oscilloscope outputs).
 - Implemented a **hardware prototype on PCB**, integrating sensor, display, power management, and alert components into a compact embedded system.
 - Gained early exposure to **biomedical instrumentation, embedded systems, and experimental validation**, forming a foundation for later research-oriented coursework and projects.

RELEVANT COURSEWORK

- **Quantum Computing & Quantum Information:** Quantum Information Theory; Quantum Computing (Matrix Mechanics-Based Formalism); Quantum Algorithms; Quantum Communication; Quantum Key Distribution; Post-Quantum Cryptography; QISKit-Based Quantum Simulation. (*Private Research Thesis Course, Mahdy Research Academy; supervised by Dr. Mahdy Rahman Chowdhury — completed first half with >80% performance.*)
- **Mathematics & Theoretical Foundations:** Differential and Integral Calculus; Differential Equations; Linear Algebra & Matrices; Vector Calculus & Complex Variables; Engineering Statistics.
- **Core Electrical & Electronic Engineering:** Electrical Circuits I-II; Electromagnetic Field Theory; Signals and Systems; Control Systems; Semiconductor Physics and Devices.
- **Electronics, Devices & VLSI:** Electronics I-II; Digital Electronics; Microprocessor and Interfacing; VLSI Technology; Power Electronics.
- **Communication, RF & Photonics:** Electronic Communication; Telecommunication Engineering; Microwave and Antenna Engineering; Optoelectronics (*Elective*).
- **Power Systems & Energy Engineering:** Electrical Machines I-II; Power Transmission and Distribution; Power System Analysis; Switchgear and Protection; Power Stations; Renewable Energy Conversion (*Elective*).
- **Interdisciplinary Systems:** Biomedical Instrumentation (*Elective*).
- **Computing & Numerical Methods:** Computing Methods for Engineering Analysis; Object-Oriented Programming; Digital Signal Processing; Numerical Methods.

UNDERGRADUATE THESIS

- **Design of a Negative Refractive Index THz Metamaterial Biosensor for Cancer Cell Detection** 2024-2025
Supervisor: Nipa Dhar, Assistant Professor, Chittagong University of Engineering and Technology [

SKILLS

- **Programming Languages:** C, C++, C#, Python, Assembly, Verilog.
- **Quantum SDKs:** QISKit, QRISIP.
- **Data Science & Machine Learning:** NumPy, Pandas, Matplotlib, Scikit-Learn, TensorFlow, Keras.
- **VLSI Design Tools:** Cadence, LTSpice, ModelSim.
- **Operating System:** Arch Linux, Ubuntu, Debian, Linux Mint, Windows.
- **Other Tools & Technologies:** MATLAB, Multisim.

CERTIFICATION

- **IQM Quantum School Certificate** 2nd December, 2025– 4th December, 2025
IQM Quantum Computers [img alt="IQM Logo" data-bbox="915 560 943 573"]]
- **Digital Design for Industrial Control** 2024-2025
Enhancing Digital Government and Economy (EDGE) Project of Bangladesh Computer Council, ICT Division [img alt="BCC Logo" data-bbox="915 590 943 603"]]
- **Networking Basics** 2025
Cisco Networking Academy [img alt="Cisco Logo" data-bbox="915 618 943 631"]]
- **Introduction to Cybersecurity** 2025
Cisco Networking Academy [img alt="Cisco Logo" data-bbox="915 646 943 659"]]
- **Introduction to Packet Tracer** 2025
Cisco Networking Academy [img alt="Cisco Logo" data-bbox="915 674 943 687"]]

AWARDS

- **Education Board Scholarship** Chittagong, Bangladesh
Board of Intermediate & Secondary Education, Chattogram
 - Received General Grade Scholarship in Secondary School Certificate (2017-2019).
 - Received General Grade Scholarship in Higher Secondary Certificate (2019-2025).

LANGUAGE PROFICIENCY

- **English:** Proficient
- **German:** CEFR level: A1
- **Bengali:** Native Language

REFERENCES

Nipa Dhar
Assistant Professor, Department of EEE,
CUET, Chattogram
Supervisor - Undergraduate Thesis
Email: nipa@cuet.ac.bd
Google Scholar

Dr. Mahdy Rahman Chowdhury
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North South University, Dhaka
Supervisor - Private Research (*Quantum Computing*)
Email: mahdybuet@gmail.com
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