Program Profile		
Program	Program name	Mizanur Rahman
	Category	(Select one category from A1–A8 or B1–B8 and write it here. For example, if the program is A1: Student Support and Engagement, write '**A1**'.)

Summary of Program			
Program Name		Mizanur Rahman	
Category		A8. Special Topic 2: Support for Global Resilience	
Abstract of Program			
Details of Program			
Planning			
Objectives	Long-term Goals	• Resilient **System Design** – Propose and validate protective shielding and hardening techniques for critical electronic systems. • Policy **& Safety Guidelines** – Contribute to developing EMP protection standards for defense, aerospace, and civilian infrastructure. • Integration **with AI/ML** – Use machine learning for real-time detection, prediction, and mitigation strategies against EMP threats. • Sustainable **Defense Solutions** – Support the design of energy-efficient, EMP-resistant technologies to ensure long-term security and reliability.	
	Short-term Targets	• Understand **EMP Fundamentals** – Study the physical principles of EMP generation, propagation, and interaction with different environments. • Data **Collection & Simulation** – Conduct experiments or simulations to analyze EMP waveforms, energy distribution, and effects on electronic systems. • Identify **Vulnerabilities** – Evaluate the susceptibility of communication, power, and control systems under different EMP scenarios. • Develop **Analytical Models** – Create mathematical or computational models to predict EMP effects on sensitive	

		electronic infrastructure.
	Rationale	The increasing dependence of modern society on electronic systems such as communication networks, energy grids, defense mechanisms, and healthcare technologies has made them highly vulnerable to electromagnetic pulse (EMP) threats. Both natural events, like solar flares, and man-made EMP attacks can severely disrupt or even destroy critical infrastructures. However, there remains a significant gap in understanding EMP energy propagation, its interaction with different environments, and the long-term consequences on technological systems. Addressing these gaps is essential not only for advancing scientific knowledge in electromagnetic theory and modeling but also for ensuring the resilience of essential services. This research will therefore contribute to developing effective protection strategies, designing EMP-resistant technologies, and guiding policy frameworks to safeguard national security and societal stability.
Subject (Leader)	Initiator(s)	Rahman
	Champion(s)	Mizanur Rahman
	Major team member(s)	Protik Barua
Environment	Nature/Society	Electromagnetic Pulse (EMP) events can have severe consequences on both nature and society. On the societal side, EMPs can disable communication networks, disrupt transportation systems, and shut down power grids, leading to large-scale economic losses and social instability. Hospitals, emergency services, and security systems may become non-functional, directly threatening human well-being and safety. In terms of nature, while EMPs do not directly harm the environment in the way pollutants do, their indirect effects—such as failure of environmental monitoring systems, breakdown of irrigation controls, or collapse of energy infrastructure—can result in ecological imbalance and harm to wildlife. Therefore, understanding EMP impacts is critical not only for protecting human society but also for safeguarding the natural systems that rely on stable human-managed technologies.
	Industry/Market	The study of Electromagnetic Pulse (EMP) energy and its environmental impact holds significant relevance for various industries and markets. Defense and aerospace sectors are directly concerned with EMP protection to ensure the resilience of military systems, satellites, and critical communication networks. The energy sector, particularly power grid operators, must address vulnerabilities to prevent large-scale blackouts and infrastructure collapse. In addition, the growing reliance on

		digital technologies in finance, healthcare, and transportation industries creates a market demand for EMP-resistant devices, shielding materials, and predictive modeling solutions. As governments and private organizations prioritize national security and infrastructure resilience, the market for EMP protection technologies and risk assessment tools is expected to expand, providing strong industrial applicability for this research.
	Citizen/Government	The impact of Electromagnetic Pulse (EMP) events on citizens and governments is profound, as these events can disrupt essential services that support daily life. For citizens, EMP-induced failures in power, communication, transportation, and healthcare systems could lead to widespread chaos and safety concerns. Governments, on the other hand, face the responsibility of ensuring national security, protecting critical infrastructure, and maintaining public confidence in times of crisis. Effective EMP research can guide policy-making, emergency preparedness, and investment in protective technologies, enabling governments to implement stronger defense measures and build resilient infrastructures. This not only safeguards citizens' lives and property but also strengthens trust in governmental institutions during unforeseen disruptions.
Resources	Human resources	The program currently has a core team of researchers & engineer, which is sufficient for prototype development and pilot testing. However, additional specialists in regulatory affairs, data security, and large-scale deployment may be needed as the project scales.
	Financial resources	The program has adequate initial funding for research, development, and pilot testing. However, additional financial support will be required for large-scale deployment, regulatory approvals, and commercialization efforts.
	Technological resources	The program has adequate technological infrastructure for prototype development, including access to IoMT devices, cloud platforms, and machine learning tools. However, scaling and integration with national health systems may require enhanced technical capabilities and partnerships.
Mechanism	Strategy (Weight/Sequence)	1. Subject (Priority: High, Sequence: 1) Focus on developing and validating the ensemble Electromegnetic pulse model for environment. 2. Environment (Priority: Medium, Sequence: 2) Ensure the system operates reliably across diverse environments (hospitals, clinics) and adapts to environmental variables. 3. Resources (Priority: Medium, Sequence: 3) Secure and optimize technological, financial, and human resources to support development, testing, and scaling phases.

	Organization	The university's interdisciplinary structure, combining departments of engineering, healthcare, and data science, aligns well with the program's strategic goals. This facilitates collaboration, resource sharing, and innovation needed for EMP development and deployment.
	Culture	The university's culture of innovation, collaboration, and community engagement strongly supports the program's execution. However, traditional bureaucratic processes may occasionally slow decision-making and resource allocation.
Doing		
Launch date		February, 2025
Responsible organization		The program will be executed primarily by World University of Bangladesh, with potential collaboration from electromegnetic pulse institutions.
Program content and process		The program will focus on a structured exploration of Electromagnetic Pulse (EMP) energy and its impact on various environments, with an emphasis on resilience strategies. The content will include theoretical foundations of EMP generation and propagation, modeling and simulation of EMP effects on critical infrastructure, and case studies of real-world incidents. The process will involve a combination of literature review, data analysis, experimental modeling, and computational simulations. Furthermore, the program will integrate interdisciplinary approaches, combining physics, electrical engineering, and cybersecurity perspectives to provide a holistic understanding. Regular workshops, presentations, and collaborations with industry and government agencies will ensure the findings are practical and impactful.
Key highlights of the content/process		Content: Foundational Study – Basics of EMP generation, propagation, and classification. Modeling & Simulation – Computational analysis of EMP effects on systems and infrastructure. Data-Driven Insights – Use of experimental data and case studies to validate findings. Interdisciplinary Approach – Integration of physics, electrical engineering, and cybersecurity perspectives. Impact Analysis – Evaluation of EMP influence on nature, society, and critical sectors. Resilience Strategies – Development of protective measures and mitigation frameworks. Collaboration – Engagement with industry experts and government stakeholders.

	Knowledge Sharing – Workshops, presentations, and publications to disseminate results.
Differences from traditional approaches	• Traditional **Approaches**: • Focus mainly on **theoretical models** of EMP effects. • Limited to **laboratory testing** and small-scale simulations. • Emphasis on **hardware-based shielding** and protection only. • Less integration of **data-driven or AI-based analysis**. • Reactive strategies after incidents rather than predictive prevention. • Proposed/**Modern Approach**: • Uses **machine learning & data analytics** for predictive modeling of EMP impacts. • Incorporates **interdisciplinary perspectives** (engineering, physics, cybersecurity). • Explores **simulation at large scale** with real-world scenarios. • Develops **proactive mitigation frameworks** rather than just damage control. • Provides **flexible, adaptive solutions** for both government and industry applications.
Progress as of today	Significant progress has been made in developing the wearable sensor prototype and initial machine learning models. Data collection and preliminary testing are underway. However, full system integration, large-scale pilot testing, and regulatory compliance processes remain to be completed.
Problems in implementation	Challenges Hindering Progress: * Delays in hardware procurement and sensor calibration. * Limited access to diverse, high-quality training data for machine learning models. * Regulatory uncertainties and compliance complexities. * Coordination difficulties among interdisciplinary teams and external partners.
Approaches to solve the problems	Data limitations were mitigated by collaborating with healthcare institutions for access to diverse datasets. Regulatory guidance was sought from experts to streamline compliance.
Completion date, if completed	August, 2025

Seeing	
Impacts on students	Studying Electromagnetic Pulse (EMP) Energy and the Impact of the EMP Environment can have significant effects on students by enhancing both their theoretical knowledge and practical skills. It exposes them to advanced concepts in physics, electrical engineering, and environmental science, fostering an interdisciplinary understanding of how EMPs can disrupt electronic systems, power grids, and communication networks. Through experiments, simulations, and research projects, students develop critical problem-solving abilities, analytical thinking, and innovation skills, particularly in designing EMP-resistant technologies. Furthermore, this topic raises awareness of real-world implications, including disaster preparedness, cybersecurity, and the ethical and societal responsibilities associated with EMP phenomena. Engaging with this subject also opens career opportunities in defense, electronics, telecommunications, and disaster management, while promoting teamwork, collaboration, and a global perspective on technological vulnerabilities. Overall, studying EMP energy equips students with both technical expertise and a conscientious understanding of its broader impacts on society.
Impacts on professors	Professors are satisfied with the program's progress, noting strong research outputs and effective student engagement. They value the interdisciplinary collaboration and the program's alignment with advancing environment innovation and healthcare and SDG 3.
Impacts on university administration	The university president and administrators are pleased with the program's progress and impact, recognizing its contribution to innovation, research excellence, and societal benefit. They support continued investment and scaling efforts.
Responses from industry/market	Few industry partners have shown positive interest in the program's innovative approach. However, some express the need for clearer pathways for stronger collaboration frameworks.
Responses from citizen/government	Local citizens appreciate the program's focus on accessible healthcare and early disease detection. Government officials are supportive due to its alignment with public health goals, though both call for continued transparency and wider outreach.
Measurable output (revenues)	The program is expected to ensure cost savings through early viral infection detection by reducing hospital admissions and treatment expenses.
Measurable input (expenses)	The program has used an initial investment of 50,000 BDT covering hardware development, software engineering, and pilot testing.
Cost-benefit analysis for effectiveness	Total Expenses: 50,000 BDT (development, testing, compliance) Generated Revenue/Cost Savings: It is yet to evaluate Effectiveness: The program is expected to show a return on investment in the first year, indicating strong financial and social value.

Future Planning	
Where does the project go from here?	The WIHMS program has laid a strong foundation for transforming healthcare through innovative EMP technologies. By enabling early detection of viral infections, it contributes significantly to public health and aligns with global sustainability goals. Continued collaboration, refinement, and scaling will ensure lasting impact and improved well-being for communities worldwide.
Addendum	
Exhibits, pictures, diagrams, etc.	
Reports, mimeos, monographs, books, etc.	(Describe the specific documents that validate the program, and list them here.)
Others which may help explain the program (including website links)	(Include any materials that may help validate the program; links to the program's website will be especially useful.)