# Final Year Project Showcase Batch-2021
# For the Year 2025

## Department of Textile Engineering
Name of Programme: Textile Sciences

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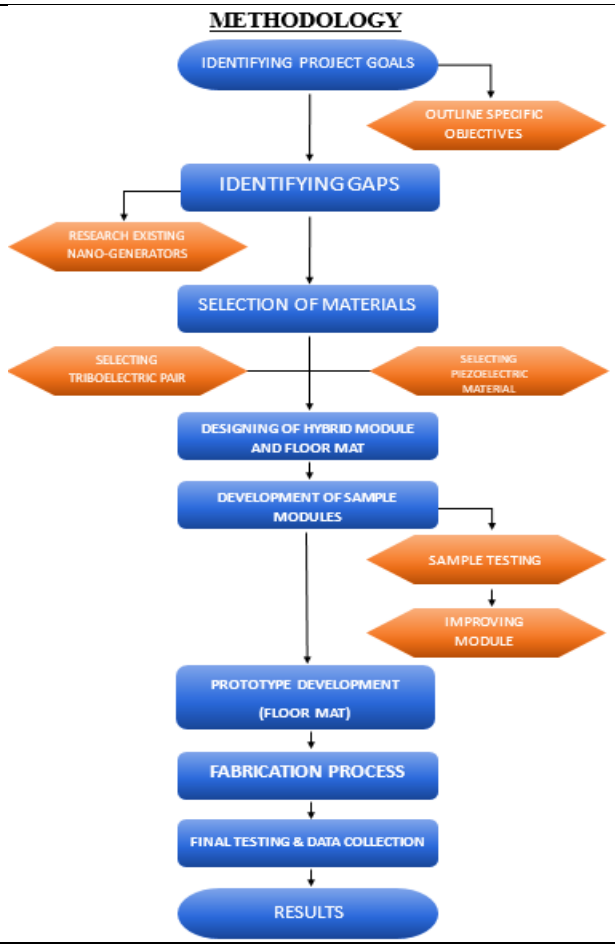
| 1 | **Project Idea** | Development of Soft Hybrid Nanogenerator for Green Energy Harvesting |
| 2 | **Process** |  |
| 3 | **Outcome** | The core innovation lies in the integration of triboelectric nanogenerators (TENGs) and piezoelectric nanogenerators (PENGs) into a hybrid system that converts mechanical energy into usable electrical energy. The soft, energy-harvesting mat utilizes textile-compatible and eco-friendly materials such as twill-woven cotton, PTFE (Teflon), and ceramic-based piezoelectric transducers. To ensure environmental safety, the design avoids nanoparticles and hazardous substances and adopts low-cost, scalable fabrication methods.<br><br>Experimental testing confirmed the system's energy conversion capability, especially in charging low-voltage energy storage devices. In controlled tests, six 1.2V rechargeable cells discharged to 0.46–0.69V were connected to hybrid modules in the mat. Under simulated foot traffic (50 kg load at one step per second), the cells progressively recharged. One cell achieved a full charge of 1.2V within 60 minutes, while others showed steady voltage recovery, |

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| | | validating the prototype's potential in powering small electronics and IoT devices. |
| **4** | **Evidence (Theoretical Basis)** | |
| **5** | **Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them) Please keep relevant options, delete the rest of them, and correct the sequence | |
| **c** | **Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region) | This report documents the design, development, and performance evaluation of a textile-based hybrid nanogenerator prototype created to harvest green energy from everyday mechanical movements, particularly human foot traffic. Aligned with the United Nations Sustainable Development Goal 7: "Affordable and Clean Energy," the project aims to reduce reliance on non-renewable energy sources by offering a scalable and sustainable alternative for wearable and flooring-based applications. |
| **g** | **Any Other Aspect** | As part of our Final Year Design Project (FYDP), our team had the opportunity to actively participate in prestigious national and international platforms, where our work received valuable recognition and appreciation.<br><br>**1.1.** Participation In ICKT at NTU, Faisalabad:<br><br>We presented our FYDP at the *International Conference on Knowledge-Based Textiles* held at the National Textile University (NTU), Faisalabad. This event brought together experts, researchers, and scholars from across the globe to discuss innovative developments in textile science and engineering. Our project was featured in the poster competition segment, where we competed against numerous participants, including several PhD scholars. We were honored to secure **3rd position** in the competition and were awarded a **cash prize of PKR 10,000**, recognizing the novelty and practical relevance of our research.<br><br>**1.2.** Participation In 4th Sindh Research and Technology Expo, Karachi:<br><br>We also showcased our project at the *4th Sindh Research and Technology Exhibition* held at the Expo Center, Karachi. This large-scale event provided a platform for university students and researchers across Sindh to display their innovations to industry professionals, academic experts, and the general public. Our project received significant attention and was featured in various media channels, highlighting its contribution to sustainable energy solutions through textile-based nanogenerator technology. |

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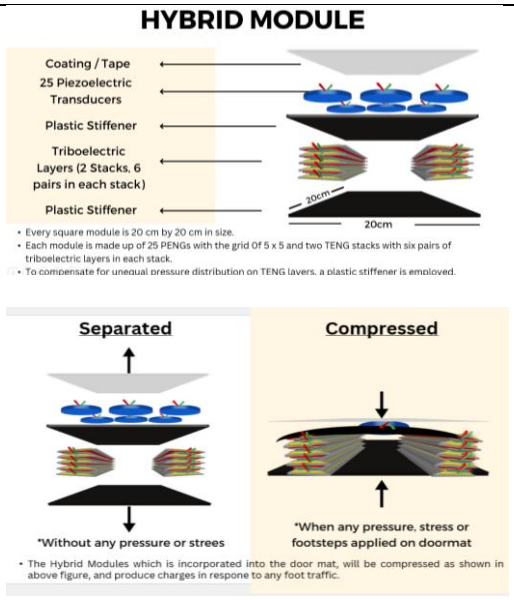
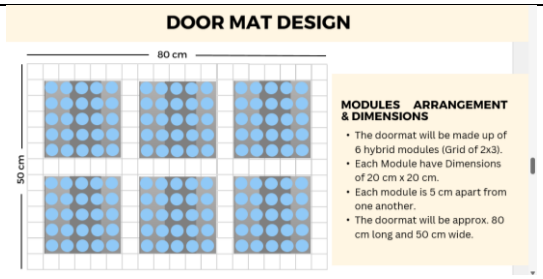
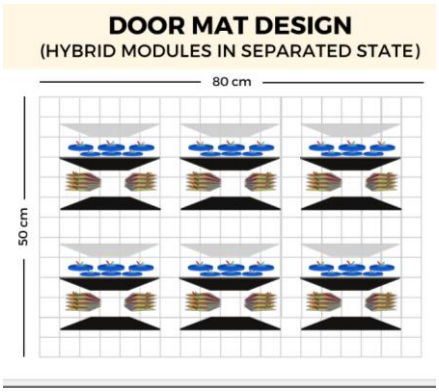
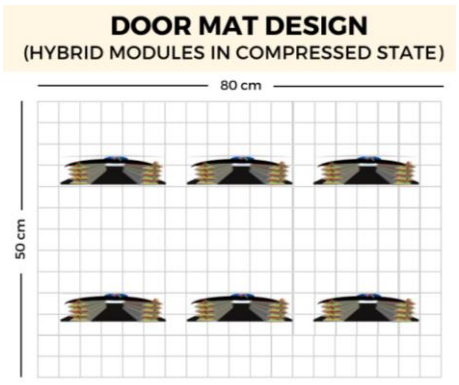
| | | These achievements not only validate the quality and impact of our research but also encouraged us to further pursue innovation and contribute meaningfully to the field of textile-based energy harvesting technologies. |
| **6** | **Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service | Real-world evaluations assessed the prototype's durability, wear resistance, and environmental stability. The hybrid nanogenerator consistently powered LEDs under repeated mechanical stress, demonstrating its applicability for high-traffic areas and integration into smart flooring or wearable technologies.<br><br>This project bridges advanced material science and sustainable engineering, offering an affordable, eco-friendly energy solution. Future work will focus on enhancing efficiency, improving structural design, expanding deployment, and conducting detailed mechanical and simulation testing to maximize performance and adaptability |
| **7** | **Team Members (Names & Roll No.)** | Javeria Bibi,TS-21067<br>Rohaan Yousuf, TS-21014<br>Salahuddin Murtaza, TS-21015<br>Saffaan Irfan Siddiqui, TS-21074 |
| **8** | **Supervisor Name** | PI: Engr. Dr. Muhammad Amir Qureshi, Textile<br>Co-PI:Engr. Dr. Rizwan Aslam Butt, Telecommunications |
| **9** | **Supervisor Email Address** | qureshi@neduet.edu.pk , **WhatsApp: +923363685329** |
| **10** | **Pictures (If any)** |  |



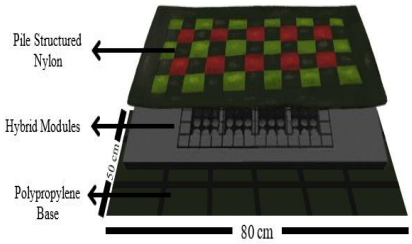




Figure 14: Layout of Floor Mat (Chapter 3)

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| | |  <br>Figure 15: The Prototype of Door Mat (Chapter 3) |
| **1** | **Video (If any)** | https://drive.google.com/file/d/1PyMsjE23eOncabAe25X7h7Rey5g8IgeE/view?usp=drive_link<br>https://drive.google.com/file/d/1UehiWcgU7jOgoS5mId_SCaeMpUGeI8T9/view?usp=drive_link |