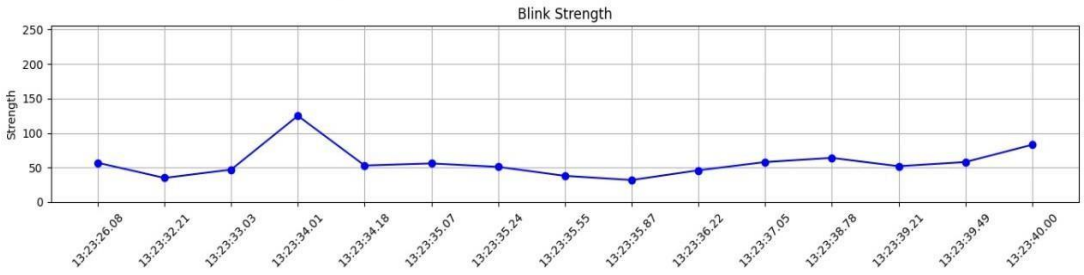
Final Year Project Showcase Batch-2021
for the Year 2025

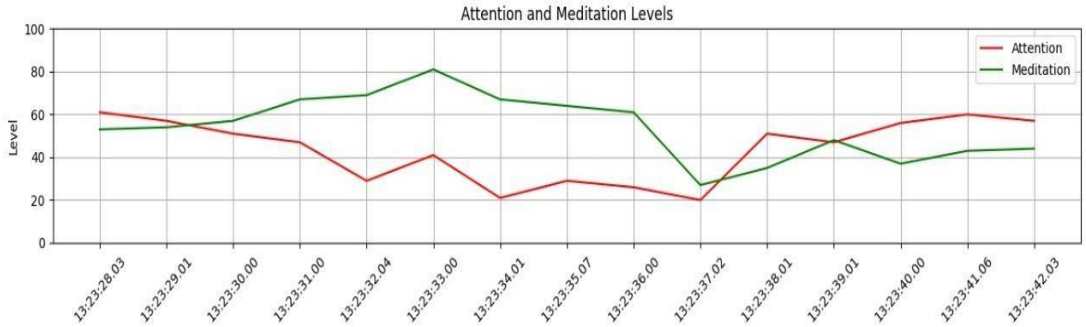
Department of Telecommunications Engineering Name of Programme: Telecommunications Engineering		
1	**Project Idea**	**Design and Development of EEG-Based Cursor Control** This project uses a low-cost NeuroSky Mindwave Mobile 2 EEG headset to design a Brain-Computer Interface (BCI) system that allows real-time control of a 2D computer cursor using attention, meditation, and blink signals. It enhances digital accessibility for individuals with motor impairments.
2	**Process**	The system uses real-time attention, meditation, and blink strength values from the NeuroSky MindWave headset to control cursor movement and simulate clicks. These signals are classified using a Support Vector Machine (SVM), enabling accurate command prediction without extensive preprocessing. Two applications were developed: a Pygame-based simulation with interactive controls and a real-time on- screen cursor controller using brainwaves. SVM was selected for its reliability in live conditions over other tested models like Random Forest and KNN.
3	**Outcome**	The project achieved reliable real-time 2D cursor control using EEG signals, with SVM offering consistent classification performance. Despite challenges such as unstable headset connectivity and blink control complexity, the system performed well in both simulation and real-world use. It successfully demonstrated the potential of single-channel EEG-based control, providing a solid base for future assistive technologies.
4	**Evidence (Theoretical Basis)**	This project is backed by literature reviews and research on EEG-based cursor control using NeuroSky and similar headsets. Multiple classifiers and preprocessing techniques were studied and tested. Real-time EEG signal interpretation has been demonstrated in prior works and is the foundation of this system.
5	**Competitive Advantage or Unique Selling Proposition** The project offers a low-cost, single-channel EEG-based solution for hands-free cursor control, eliminating the need for complex hardware or preprocessing. It improves accessibility for users with motor impairments and supports SDGs like Reduced Inequalities and Industry, Innovation and Infrastructure. With its simplicity, reliability, and real-time performance, the system stands out for assistive tech and BCI applications.	
a	**Cost reduction of existing Product**	Traditional EEG-based BCI systems typically rely on multi-channel headsets, external amplifiers, and complex software, making them expensive and less accessible—often costing hundreds to thousands of dollars. This project drastically reduces cost by using the NeuroSky Mindwave Mobile 2, a single-channel, consumer-grade EEG headset, priced significantly lower. Additionally, the use of free, open-source tools like Python, Pygame, and PyAutoGUI eliminates licensing fees, making the overall solution affordable for individuals, rehabilitation centers, and researchers in low-resource settings.

b	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of the whole process** (e.g. What is the issue is current process and what improvement you suggests)	The current BCI systems for cursor control often rely on complex multi-channel EEG setups with extensive preprocessing and training, which increase cost and reduce accessibility. This project improves the process by using the NeuroSky Mindwave Mobile 2, a low-cost, single-channel headset with built-in feature extraction, eliminating the need for manual signal processing and reducing overall system cost. The system streamlines interaction through attention, meditation, and blink signals, enabling real-time control without specialized or expensive hardware. Additionally, by selecting SVM for classification, the model achieves balance of accuracy and efficiency. This simplified yet effective approach not only improves usability but also significantly lowers both development and deployment costs, making assistive BCI technology more accessible for broader populations.
c	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	This project directly supports SDG 9: Industry, Innovation and Infrastructure by promoting the development of innovative, low-cost brain-computer interface technology. It also aligns with SDG 10: Reduced Inequalities by creating accessible solutions for individuals with motor impairments, enabling them to interact with digital systems independently. The system encourages inclusivity and technological advancement in the assistive tech sector.
d	**Expanding of Market share** (e.g. how it expand and what is the problem with the current market	Most assistive BCI systems are expensive and limited to clinical or research settings. This project offers a low-cost, user-friendly alternative, enabling wider adoption in schools, homes, and rehabilitation centers—expanding the market beyond traditional users.
e	**Capture new market (**e.g. Niche market or unaddressed segment**)**	The system targets a niche market of individuals with motor impairments who need affordable, real-time, hands-free control. It also opens opportunities in emerging areas like wearable tech and hands-free computing for the general public.
f	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.)	No
g	**Any Other Aspect**	No
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	This system targets individuals with physical disabilities, rehabilitation centers, BCI researchers, and accessibility software developers. Its affordability and ease of use make it suitable for home use, clinical environments, and educational institutions.
7	**Team Members (Names & Roll No.)**	Ayesha Arshad (TC-21047) ayeshab15555@gmail.com Tanzeela Shakeel (TC-21050) tanzeelaarain213@gmail.com Bareeha Amin (TC-21059) bareeha.amin349@gmail.com
8	**Supervisor Name**	Dr. Komal Masroor
9	**Supervisor Email Address**	komal.masroor@neduet.edu.pk
10	**Pictures (If any)**	

NeuroSky MindWave Mobile 2 Headset



Real Time Blink Strengths Obtained by the Headset



Real Time eSense Data Obtained by the Headset

11	**Video (If any)**	https://drive.google.com/drive/folders/1xOzcGnefNmRQp3NEef7gNdb2ROjii9xx?u sp=sharing