Final Year Project Showcase Batch-2018
Year 2022

Department: Biomedical Engineering Programme: Biomedical Engineering		
1	**Project Idea**	Wearable Heat Stroke Prevention Device
2	**Process**	The heatstroke prevention device is comprised mainly of thermoelectric cooler that is Peltier module, temperature sensor, relay, exhaust fans, microcontroller and power supply. The device will work on principle of Peltier effect. The working of this device includes temperature control mechanism, whenever the body temperature will rise above the normal range the sensor will sense it and send signals to microcontroller to give power to relay and it will be turned on. The relay will give signal to the Peltier and they will start cooling down from one side and heat up from other side. The exhaust fans connected with Peltier through heat sink on the hot side will dissipate heat in the atmosphere. The Peltier will provide cooling until the body temperature will return back to normal hence preventing the heat stroke.
3	**Outcome**	It was observed that, the cooling performance was better than expected. All Peltier units worked perfectly in sync. The heat generated due to thermoelectric effect was dissipated by the heat sink and exhaust fans, efficiently. The circuit worked accurately, giving positive results. There was slow change in temperature which could be improved with a different and more compatible sensor. The efficiency and weightage of the device was improved to achieve customer comfort and better performance with uniform cooling. This device, compared to the prototype is light weight and achieves uniform cooling. Cost-wise the device is also beneficial.
4	**Evidence (Theoretical Basis)**	With the surge in global warming throughout the decades, the surface temperature of earth has risen by 0.08 degrees (Celsius), which results in extremely hot weathers and the likelihood of heat strokes. This gave rise to the need for prevention of heat strokes, which we intent to achieve by the presented idea of wearable heat stroke prevention device. The purpose of this study is to develop a wearable temperature-controlled device which can be used to prevent heat strokes by the use of thermoelectric cooler (TEC). Thermoelectric cooler (Peltier) is used to provide cooling effect by creating a temperature differential on each side of the plates. Arduino Nano is used as a microcontroller along with temperature sensor, DS18B20. The output of temperature sensor is the trigger for Peltier's function, with a pre-set range of temperature defined. Concept designs are considered, shaped and assessed. The product is embedded in a wearable cap/helmet and the performance of the product is promising,

		sufficient and temperature-controlled cooling is achieved. Temperature sensing mechanism is successfully achieved with the help of temperature sensor, attached to the back of the ear. The weight of the cap is a minor issue which can be resolved with design modification of the product along with the size of the circuit which can be made a bit more compact. Overall, the cooling cap worked successfully on healthy individuals in a hot environment (36°C), cooling was achieved almost instantly after the temperature raised above the normal range defined (37°C). Testing and validation of the device proved the efficiency of the device in providing cooling. With further desirable modifications including, miniature circuit design, impact-proof helmet for customer safety, and even lighter weight of the device, this product will be able to achieve the desired results more efficiently.
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	
a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	**SDG#3**: **Good Health and Well Being,** is incorporated which refers to health and well-being of all people, by providing them access to primary healthcare related to heat stroke. This heat stroke prevention device will increase chances for people to fight heat stroke and remain healthy. Deaths due to heat strokes can be decreased with this device, it enhances well-being of people. **SDG#13: Climate Action** is also included, which refers to Climate Action, by creating a device that will combat the effects of climate change and global warming. Heat strokes are one of the major impacts of climate change and providing a way to prevent people from heat strokes stands with the SDG 13.
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.)	The device is designed to fight against the extreme temperatures so as to prevent heat stroke.
c	**Cost Reduction of Existing Product**	The cost of the device was around 20,910/- . The cost is reduced by using locally available componets .
d	**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)	• Circuit should be more compact • The design of the cap can be modified to look like a smart cap • Reliability can be increased by using a light weight battery • The cap should be safe and secure
e	**Expanding of Market share** (e.g. how it expand and what is the problem with the current market	Since this devive is not locally available in the market and its almost a necessity for people of Pakistan, market share will be major, we can increase market share by lowering prices in a way that it does not impact the company's financial status (699 is considered affordable than 700) and investing in digital marketing to increase customer outreach.

f	**Capture New Market** (e.g. Niche market or unaddressed segment)	the market niche for this project would be consumers who spend most of their time working outside or companies who employ these people, we can capture these consumers with engaging marketing strategies, workshops and an open-house kind of display. Since people don't really believe the impact of an object unless they're experiencing it.
g	**Any Other Aspect**	In short the device is great and it will have a big market share in future.
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	Hospitals. Construction Industry Students Bike Racers
7	**Team Members** (Names along with email address)	Amna Ahmed amna.ahmad20019@gmail.com Fatima Imran fatimaimran006@gmail.com Maryam Rukshar maryamsami778@gmail.com Muhammad Moiz Khan kmohammadmoiz01@gmail.com
8	**Supervisor Name** (along with email address)	Dr. Muhmmad Abul Hasan abulhasan@neduet.edu.pk
10	**Pictures (If any)**	 Fig: Final Prototype of Heatstroke Prevention Device