

# APNEMETER:

(Sleeping Apnea Detector)

Don't let the  
inconvenience kill you



**Module EN1190: Engineering Design Project  
Product Design Proposal**

**Project Name: Apnrometer** (Sleeping Apnea Detector)

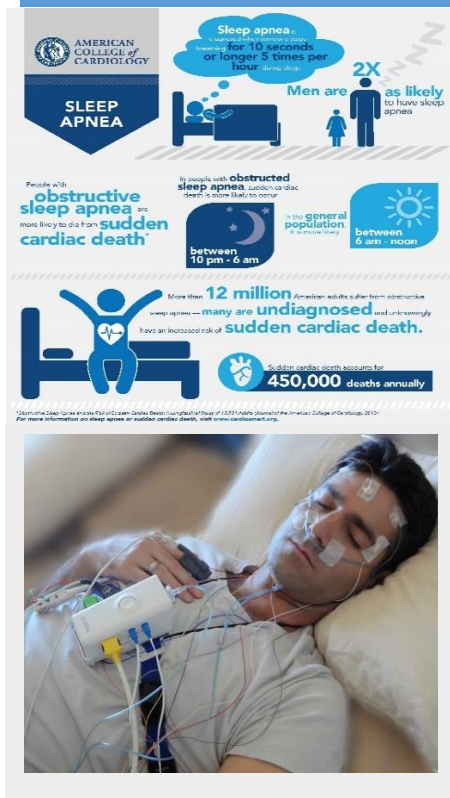
**Group EN-13**

**Due Date: 20<sup>th</sup> June 2022**

**Date of Submission: 20<sup>th</sup> June 2022**

Liyanaarachchi D.S.G.L.S.	200345N
Liyanage P.H.S.	200352H
Lokugeegana D.L.	200356A
Luckshan G.W.C.M.	200358G

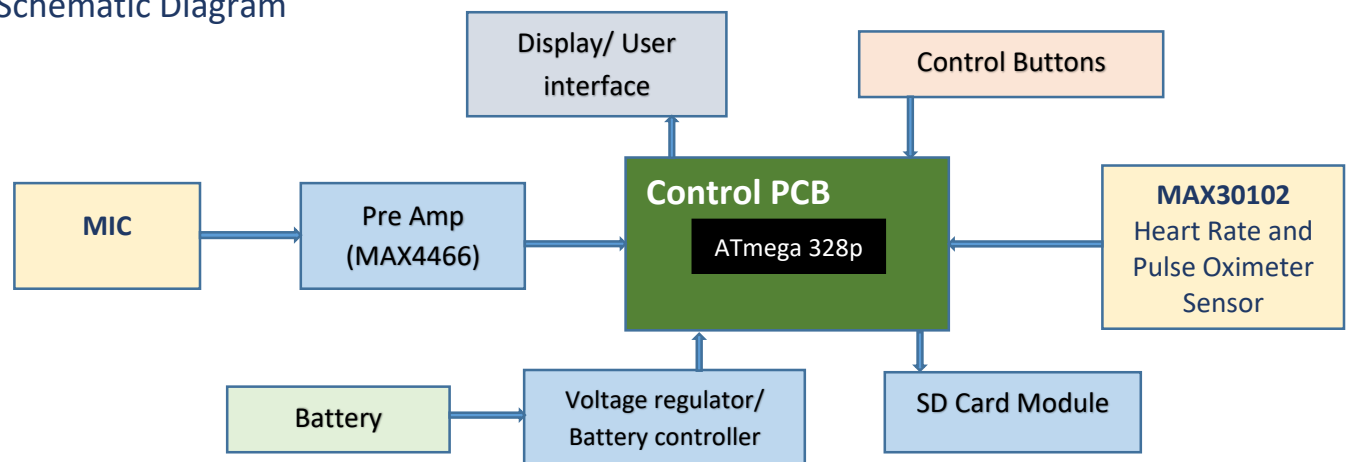
## Problem



- Snoring while sleeping is a **common condition** that we see in the society. Sleeping apnea is a condition that occurs due to blockage of airways to the lungs and the body is deprived of oxygen during sleep.
- Statistics show that nearly **25 Million people** in USA suffers from obstructive sleep apnea. (**American Academy of sleeping Medicine**) <https://aasm.org/rising-prevalence-of-sleep-apnea-in-u-s-threatens-public-health/>
- Sleep apnea is a serious condition even though people usually neglect it. This would have a serious effects ranging from depression & anxiety, hypertension, cardiac arrhythmia, strokes or even to a sudden cardiac death if undiagnosed. (**Journal of the American college of cardiology**) <https://pubmed.ncbi.nlm.nih.gov/23770166/>
- The current diagnostic method for this condition is **sleep polysomnography** which is a **bulky device** and requires to be admitted to a hospital or a place with a trained technician. The **high cost** of the device makes could not be used to personally collect data for a longer period of time. <https://www.newchoicehealth.com/procedures/sleep-study-polysomnography>
- These **inconveniences make people reluctant to be tested** hospitalized, so there is a **vacancy for a smaller easy to use device at home** that could be used as an initial test and then decide whether the severity of the condition requires further testing.

## Solution

- ❖ A **simple device** that could be used at home which records **snoring sounds** and records vital indicators such as **blood oxygen saturation, heart rate** etc.
- ❖ Schematic Diagram



- ❖ **Functionality (Basic)** : **MAX30102** inputs heart rate and blood oxygen level, **Mic** input comes via the pre amp(MAX4466). Audio signal is saved in wav format and H/R and O2 level is saved as a text file in comma separated value format in the **SD card**. A **PCB** is to be designed. **ATmega328p** microcontroller is suggested and capable in sampling and quantizing the audio in the desired level.
- ❖ **Functionality (Extended suggestions to be added if possible)**: A computer software that could visualize csv files containing heart rates, O2 saturation levels into graphs. Few features to analyze the audio signal or detect snoring sounds also could be added to the software. (frequency is depending on obstruction location tonsil-1000Hz, larynx 652 Hz, tongue base 330Hz, etc.)