



Company Information

Company Name	Advanced Respiratory and Sleep Medicine, PLLC	Date Submitted	5/19/2025
Project Title	<i>Analysis of physiologic measures from consumer wearables to characterize sleep and breathing (Advanced_WEAR)</i>	Planned Starting Semester	Fall 2025

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical		Electrical	2
Computer	2-3	Systems	

Company and Project Overview:

Advanced Respiratory and Sleep Medicine, PLLC is a private pulmonary and sleep medicine clinic and research center with offices in Huntersville and Hickory, NC. Since opening our doors in 2010, we have cared for more than 75,000 patients. Advanced Respiratory and Sleep Medicine (ARSM) partners with pharmaceutical and medical device companies to research new products and technologies that may someday impact peoples' lives. The ARSM team includes Thomas Stern, MD, MS; Todd M. Thompson, PA-C; and Felix Kurniawan, MS. Studies conducted at Advanced Respiratory and Sleep Medicine, PLLC include trials that have contributed to the approval of medications such as Breo, Trelegy, Stiolto, Breztri, Sunosi, Xywav, Wakix, and Lumryz to name a few. ARSM conducts research in many areas including:

- Sleep testing
- Pulmonary function testing
- Electrocardiography



- Clinical laboratory
- Psychological and psychometric testing

Project Requirements:

Consumer wearables, including smart watches and smart rings, contain hardware that monitors physiologic parameters of the individual wearing them. These consumer wearables provide a widely available and low cost option to obtain physiologic measures to assist in the diagnosis and management of disease. Recently, the Apple Watch was approved by the FDA for the diagnosis and management of obstructive sleep apnea. Sleep apnea is a disease associated with an increased risk of heart attack, stroke and motor vehicle accidents. Smart watches have also been shown to aid in the diagnosis of cardiac atrial fibrillation which can cause stroke. Consumer wearables routinely provide feedback regarding sleep staging and sleep quality.

Currently, the raw data obtained by consumer wearables is not available to physicians for analysis. The algorithms used to analyze the data are proprietary so diagnostic accuracy is not available. Even if the data was available, most physicians do not have the skill set to analyze large data sets to provide actionable measures for individual patients. The goal of this project is to identify a platform that will allow for the access and analysis of the physiologic data from a consumer wearable so diagnostic accuracy can be determined in order to improve care delivery.

Expected Deliverables/Results:

- Identification of a consumer wearable with optimal hardware to provide physiologic data for sleep and breathing disorders
- Identification of method to access the data of the consumer wearable
- Development of algorithms to analyze the data and provide
- Full documentation of all methods

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):



- Interest in app development for consumer wearables
- Students selecting or assigned this project agree that the industry sponsor will own the results of the project.
- Machine Learning interest
- ECGR 4105 - Introduction to Machine Learning