UNC Charlotte – Lee College of Engineering Senior Design Program

Process for Supporting a Senior Design Project

Sponsor	ME Department	**Date Submitted**	*07/24/2024*
Project Title	*Development of a Portable and User-Friendly Hydrostatic Weighing Device for Accurate Body Composition Analysis (UNCC_ME_WEIGH)*	**Planned Starting Semester**	*Fall 2024*

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	3-4	Electrical	
Computer		Systems	

Project Requirements:

Hydrostatic weighing, also known as underwater weighing, is a highly accurate method for measuring body composition, specifically body fat percentage. It has long been considered a gold standard due to its precision. However, traditional hydrostatic weighing systems are often bulky, expensive, and require specialized facilities, limiting their accessibility for everyday use. This project aims to design and develop a portable, cost-effective, and user-friendly hydrostatic weighing device that can be used in various settings, including fitness centers, research laboratories, and health clinics.

Hydrostatic weighing involves measuring an individual's weight while submerged in water. By comparing the individual's weight in air to their weight underwater, and knowing the density of water, it is possible to calculate body density and, consequently, body fat percentage. This method relies on Archimedes' principle, which states that the buoyant force on a submerged object is equal to the weight of the fluid that the object displaces.

- To design a portable hydrostatic weighing device that is easy to use and transport.
- To ensure the device provides accurate and reliable measurements of body composition.
- To develop a user interface that simplifies the process for both the operator and the user.
- To integrate safety features that ensure the well-being of users during the weighing process.
- To create a cost-effective solution that makes hydrostatic weighing more accessible.

Expected Deliverables/Results:

A fully functional prototype of a portable hydrostatic weighing device.
Comprehensive documentation including design specifications, user manuals, and testing results.

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

- Biomedical Engineering concentration
- Course 4271-5271 and/or 4272-5272
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