

2. Requirements, Constraints, And Standards

2.1 Requirements and Constraints

Functional Requirements

- **Pressure Sensing:** The mat must detect and measure pressure levels across multiple zones of the lower extremities, providing real-time feedback.
- **Threshold-Based Alerts:** The system must notify the user when pressure exceeds a set threshold in any zone, helping prevent pressure sores.
 - Constraint: Alert within 5 seconds of threshold breach.
- **Wireless Connectivity:** The mat must wirelessly transmit data to a mobile app for remote monitoring.
 - Constraint: Bluetooth range of up to 10 meters.
- **Data Storage:** The app must store pressure data logs for post-use analysis, with at least 7 days of data retrievable at any time.
- **Multi-Zone Sensitivity:** The mat must distinguish between different pressure zones, allowing for precise monitoring of specific areas
 - Constraint: Minimum of 8 sensor zones across the mat.

Resource Requirements

- **Sensor Technology:** The mat must integrate pressure-sensitive sensor technology (e.g., Sensitronics Matrixarray, Load Cell) capable of detecting small changes in pressure.
 - Constraint: Detects pressure up to 100lbs.
- **Power Source:** The system must be powered by a rechargeable battery that allows for continuous use.
 - Constraint: Minimum battery life of 8 hours.
- **Microcontroller:** The system must include a microcontroller that can process data from multiple sensors and handle wireless transmission (e.g., Arduino or ESP32).

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Physical Requirements

- **Mat Dimensions:** The mat must be large enough to cover the typical area of use for the lower extremities.
 - Constraint: Minimum size 15 inch x 15 inch.
- **Portability:** The mat should be lightweight and foldable, allowing for easy transport and storage
 - Constraint: Total weight must not exceed 2lbs.
- **Durability:** The mat must be durable and withstand regular use without sensor degradation
 - Constraint: Must function properly after at least 1000 hours of use.

Aesthetic Requirements

- **Low Profile Design:** The mat must have a thin, flexible design so it can be comfortably placed under the user's legs without causing discomfort
 - Constraint: thickness must not exceed 5mm.
- **Neutral Color Scheme:** The mat should be available in neutral colors to blend with different environments.

User Experiential Requirements

- **Ease of Setup:** The mat must be simple to set up and use, requiring minimal user interaction beyond placing it under the lower extremities.
- **Comfort:** The mat cannot cause extra pressure or friction on the skin.
- **Skin-Friendly Materials:** The surface of the mat must be made from breathable, hypoallergenic materials to avoid skin irritation during prolonged use.
- **Mobile App Interface:** The mobile app must be intuitive and provide clear, easy-to-read pressure data and alerts.
 - Constraint: average user should be able to understand the app within 5 minutes of use.

*Design Document - Requirements***UI Requirements**

- **Real-Time Visualization:** The app should display real-time visual feedback of pressure distribution across the mat, allowing users to quickly identify problem areas.
- **Customizable Alerts:** Users must be able to set custom pressure thresholds and receive notifications tailored to their specific needs.
- **Pressure History Review:** The app must allow users to review historical data and trends to track how pressure distribution changes over time.

2.2 Engineering Standards

Q1) Briefly describe, in your own words, the importance of engineering standards.

The engineer standards are important in regulating many day-to-day technologies like house power management, phone chargers, or electric vehicles, and are important for ensuring that they are safe to use.

Q2) Browse the IEEE standards website: <https://standards.ieee.org/standard/> (Links to an external site.). Select a subcategory as appropriate for your project (possibilities include "Computer Technology", "Software and Systems Engineering", and "Communications").

Describe, entirely in your own words, what each standard is about and what it is intended to accomplish.

ISO/IEC/IEEE International Standard - Software and systems engineering - Software testing -- Part 2: Test processes

- <https://standards.ieee.org/ieee/29119-2/7498/>

ISO/IEC/IEEE International Standard - Systems and Software Engineering--Life Cycle Management--Part 5: Software Development Planning

- <https://standards.ieee.org/ieee/24748-5/5664/>

IEEE 802 Nendica Report: Flexible Factory IoT: Use Cases and Communication Requirements for Wired and Wireless Bridged Networks

- https://standards.ieee.org/ieee/White_Paper/10123/

Q3) After reviewing some of the technical details of the three published standards, do you believe it to have relevance to your project? Why or why not? Be specific.

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I think the first standard has relevance to our project because it sets standards on software testing, which we will need for both our app and device. I also think the second standard pertains to our project because it covers requirements and guidelines for software development planning and management. The third standard does not relate to our project because it focuses on a factory environment, which our project is not in.

Q4) Review with your team the standards that each of you have selected. What other standards did some of your team members choose that are different?

ISO/IEC/IEEE International Standard - Systems and Software Engineering -- Life Cycle Management -- Part 6: Systems and Software Integration

- <https://standards.ieee.org/ieee/24748-6/10373/>

Q5) What modifications do you intend to make to your project design to incorporate these standards?

To ensure we are incorporating these standards, we will make sure to add software testing as a priority in our project plan. We will not need to modify anything for the second standard, as we have already set up a system for software development planning and task management.