Group 34 ABET Addendum: Manas Mantri

1. **Desired Needs:** Capable of applying physiological loads (10N-45N) to a rabbit knee joint
    - micro-CT Compatible
    - Capable of adjusting knee angle (Between 60^{o} and 150^{o})
    - Capable of adjusting total load on knee
2. **Major Constraints**
    - Compatibility with Bruker Poseidon X4 micro-CT (S/R)
    - Risk of infection when handling rabbit tissue (S/R)
    - Damaging rabbit knee samples during osseous tunnel drilling (R)
    - Instability of loading system, preventing intended force transfer (R)
    - Components need to be micro-CT compatible while maintaining durability (M)
    - Apply physiological loads and produce change in cartilage thickness (QC/M)
3. **Major Engineering Standards**
    - Components used: **ISO 13019:2018, ASME B18.2.1, ASTM F2150-2019**
    - Device constraints and performance: **ASTM D1621-16(2023), ASTM E1441,**
    - Developed from project: **ASTM E4, ISO 19233-1:2017**
4. **Ethical, Environmental, Societal Concerns**

Ethical concerns for this project include the responsible use and handling of rabbit tissue samples. Environmental concerns involve the proper disposal of biohazardous tissue waste and chemical solutions such as PBS and Hexabrix used during imaging studies. From a societal perspective, this project aims to improve understanding of osteoarthritis progression, which could contribute to better joint repair technologies and improved quality of life for patients.

5. **Active Teamwork and Leadership**

We split our design into two subprojects. We met weekly with our mentor where we discussed our progress for the week and both short and long term goals for each sub-project. We met 1-2 times per week in the lab where we gave each other feedback and worked on our sub-projects.

6. **Motivating Factors**

I was motivated to acquire new knowledge after understanding how ACL injuries alter joint mechanics and learning of the need to analyze tissue deformation in real time. This prompted me to gain new knowledge in CAD design, spring mechanics, and designing for micro-CT compatibility. I was self-initiating because the project involved a lot of individual research and design. We all worked independently to come up with design variations and came together to validate our final design. I was able to persist against challenges upon inspiration from my teammates and also upon guidance from our mentor and other CTE lab members.

7. **Innovative and Entrepreneurial Ideas**

My most innovative idea for this project is to eventually transition to a loading mechanism that is external to the Bruker Poseidon. The machine is capable of allowing cables to be run outside of the loading area, allowing for a loading mechanism that is less compact and more accurate. Entrepreneurally, this device could eventually serve as a specialized research platform for orthopedic biomechanics and pre-clinical osteoarthritis testing.