

1. Desired Needs
 - Design a compact, portable core-compression device for osteochondral core testing.
 - Apply controlled compression at 10%, 20%, and 30%.
 - Assess GAG redistribution using Hexabrix-based thickness and grey scale analysis.
2. List the major Constraints on your design/project
 - Safety/Regulatory: Device must be Bioinert
 - Risk: Device must not damage the micro-CT machine during imaging.
 - Environmental: Proper disposal of cartilage, Hexabrix, and contaminated materials.
 - Manufacturability: Device must fit within 50 mL tube and be micro-CT compatible
 - Quality Control: Platens must stay vertically aligned and the chamber must remain stable during compression.
3. List the major Engineering Standards on your design/project
 - ISO 13019:2018: Applies because the project studies GAG redistribution in osteochondral cores using Hexabrix and micro-CT imaging.
 - ASTM F2150-2019: It gives guidance for testing biomaterials and tissue-engineered products, including compression-related mechanical characterization.
 - ASTM D1621-16(2023): Guided the uniaxial compression setup, including flat platens, alignment, deformation measurement, and compressive strain calculation.
4. Explain Ethical, Environmental, and Societal concerns for practical applications

Ethical: Cartilage cores and rabbit knees must be obtained and handled under approved ethical harvesting guidelines and Unnecessary cartilage should be minimized, so non-biological samples were tested first to check the device mechanism.

Environmental: Cartilage cores, rabbit knees, Hexabrix solution, and contaminated materials must be disposed of properly to reduce biohazard and chemical waste.

Societal: Researchers could misinterpret biomechanical data from the core-compression device, so study documents and rough ImageJ based code analysis steps were created to improve data interpretation
5. Describe Active Teamwork and Leadership in your design group
 - Divided the overall project into two sub-projects during our first meetings.
 - Followed the Gantt chart and weekly meetings with our mentor, Dr. Sah
 - Shared individual progress and design bottlenecks during team meetings.
 - Received constructive feedback on how to better document versions of compression mechanisms and also how to present the results to be more readable and accessible
 - Completed assigned individual sections and reviewed them as a group to make final submission
6. What were the most significant motivating factors that led you to
 - a) acquire new knowledge : Needed to learn the micro-CT imaging process and compare load-controlled vs. displacement-controlled mechanisms.
 - b) be self-initiating : Scheduled micro-CT studies early because of access limitations and tested the device before imaging
 - c) persist against challenges and setbacks : When load control was not reliable, we got feedback from Dr. Sah, Dr. Albert Chen, and teammates, then moved forward with displacement-controlled compression.
7. Innovative and/or entrepreneurial ideas for this project
 - Designing compression mechanism
 - Automating the Python code to measure the cartilage thickness variation