

ABET Addendum (Krish Narotam)

1. List two to four Desired Needs of your project that led to your final design objectives.
 - Biomimetic Restoration: Develop a graft that replicates native articular surfaces and integrates with host tissue.
 - Gradient Structure: Combine a hydrogel cartilage region with a mineralized bone interface.
 - Controlled Mineralization: Use hydroxyapatite at the interface to promote subchondral bone integration (osteoconductivity).
 - Bioreactor Support: Design a system for reproducible growth, nutrient transport, and mechanical stability.
2. List the major Constraints on your design/project
 - Technical Precision: Minimizing contamination and managing process variability (crosslinking, mineral deposition, leakage).
 - Viability: Maintaining physiological pH, 37°C temperature, and protein bioactivity.
 - Translation: Requirements for scalability, biocompatibility, and cost-effectiveness.
 - Validation: Necessity for quantitative proof of matrix composition and mechanical integrity.
3. List the major Engineering Standards on your design/project
 - Scaffold Characterization: ASTM F2150, F2451, and F2900 for tissue-engineered performance.
 - Biocompatibility: ISO 10993 (cytotoxicity/sensitization) and ASTM F2077 (mechanical testing).
 - Regulatory Framework: FDA guidance for regenerative medicine and preclinical design.
4. Explain Ethical, Environmental, or Societal concerns for practical applications of your project.
 - Ethics: Responsible sourcing of biological tissues and ensuring patient safety via rigorous testing.
 - Environment: Proper disposal of hazardous biological waste and chemical crosslinking agents.
 - Society: Enhancing patient mobility and delaying joint replacements while maintaining healthcare accessibility.
5. Describe Active Teamwork and Leadership in your design group
 - Specialized Subprojects: Divided tasks (hydrogel, extraction, mineralization, bioreactor) to allow parallel progress.
 - Accountability: Distributed workloads based on individual strengths and technical interests.
 - Communication: Utilized weekly reviews and troubleshooting sessions for data-driven alignment.
6. What were the most significant motivating factors that led you to
 - Patient Impact: Desire to innovate medical devices that directly improve clinical outcomes.
 - Interdisciplinary Interest: Enthusiasm for combining biomaterials, tissue engineering, and mechanical design.
7. What are your most innovative and/or entrepreneurial ideas for this project
 - Commercial Scalability: Strategies focused on experimental reliability to support future technology commercialization.