BME Qualifying Exam: Rehabilitation Engineering (*Fundamental Principles in Biomedical Mechanics*)

Examiner: Prof. Jason Franz
Date: Thursday, November 16, 2023
Time/Format: Distributed at 9AM, Return before 5PM (same day)

A. Students will be expected to demonstrate and apply a basic, undergraduate-level understanding of the following concepts. Here, biomechanics will be used only as an opportunity to test the application of this fundamental understanding to relevant topics in Biomedical Engineering.

1. Vector addition of forces in 2D and 3D

2. Position vectors in 2D and 3D

3. Moments of force (scalar and vector formulations) in 2D and 3D

4. Free Body Diagrams of single and multi-body systems

5. Equations of equilibrium to solve for unknown quantities in single and multi-body systems

B. Current events in biomedical mechanics
Students should read and be prepared to critically evaluate the following article, including but not limited to rationale, methodology, limitations, implications, and creative and thoughtful extension to their own research area or interests in biomedical engineering, no matter how dissimilar that area may appear on the surface.

> Geoffrey G. Handsfield, Joachim Greiner, Josef Madl, Eva A. Rog-Zielinska, Enzo Hollville, Benedicte Vanwanseele and Vickie Shim (2020), Achilles Subtendon Structure and Behavior as Evidenced From Tendon Imaging and Computational Modeling. Front. Sports Act. Living.
> https://pubmed.ncbi.nlm.nih.gov/33345061/

Study References
- Selected sections provided from RC Hibbeler, Engineering Mechanics (Statics & Dynamics).
- Accessible via this link:

  https://drive.google.com/file/d/1dYlLzhGhRd6F7weZ3-nyfDodxUcO0Wdj/view?usp=sharing