AM5010 - Biomechanics - Syllabus

Course content:

Introduction to Biomechanics – Terminology – Anthropometry – Skeletal Mechanics – Structure of bones – Composition and properties of bones and relationship to structure – Elastic properties of bones – Characterizing elastic anisotropy - Modeling and Remodeling of bones (Wolfe's law of bone remodeling)
Viscoelasticity of soft tissues – Models of viscoelasticity (Maxwell, Voigt, Kelvin)
Muscle mechanics – Muscle architecture and mechanics – Muscle fascicles and their arrangement – Fiber architecture in fascicles – Muscle as a fiber reinforced composite – Muscle centroids – Muscle Cross sectional areas (Physiological & Anatomical) – Properties of tendons and passive muscles – Viscoelastic behavior of tendons – Tendon interaction with surrounding tissues – Mechanical properties of passive muscles
Mechanics of Active muscle: Muscle force production and transmission – Functional relations (Force - length, Force – Velocity curves), History effects in muscle mechanics – Hill's model (derivation) – Sliding filament theory
Muscle coordination – Problem of motor redundancy – Approach to studying muscle force production using optimization (forward and inverse)
Exemplary behavior: Dynamics of Reaching – Inverse dynamic modeling

Text Books:

1. Principles of Biomechanics by Robert L.Huston, CRC Press

Reference Book:

Berne & Levy Physiology, 6th Updated Edition, Bruce M. Koeppen and Bruce A. Stanton, Mosby, 2009 edition.