

# AM5010 - Biomechanics - Syllabus

## Course content:

### 1. Terminologies used in Biomechanics

Anatomical terminology, motion in the human machine, the standard human scaling relationships (Anthropometry)

### 2. Statics of Human Body

Review of forces, torques, and equilibrium, motion in one plane and levers, statics in the body, the sense of touch, units of force and pressure. Problems (2-D and 3-D).

### 3. Motion of Human Body

Kinematics and musculature, mechanics of standing, walking, running, jumping, throwing a ball and other types of motions, collisions of the human body, sustained acceleration, physics of sports.

### 4. Mechanical Property of the Human Body

Material components of the body and their elastic properties, time-independent deviations in hookean materials, static equilibrium of deformable bodies, time-dependent deviations from elastic behavior: viscoelasticity, viscoelasticity in bone, bone fractures, common sports injuries, avoiding fractures and other injuries.

### 5. Advanced Kinematics

Defining body location, Defining body orientation, Transformation matrix, Rotation matrices, Forward kinematics, Kinematic chain, Velocity of Kinematic chain, Acceleration of kinematic chain, Inverse kinematics, 2-D and 3-D problems in human motion.

### 6. Study of Muscles

Skeletal muscles in the body, the structure of muscles, passive muscles, activating muscles, a macroscopic view, the effect of exercise on muscles and their coordination, active/tetanized muscles, a microscopic view, hill force–velocity curve, the sliding filament model, a nanoscopic view.

7. Advanced topics: Inverse dynamics – with an example of reaching, interaction torques, computation of interaction torques. (REF: Zatsiorsky, Kinetics of human motion).

## Reading Materials (These books are available in the library)

1. Irving P. Herman, Physics of the Human Body, Springer, New York, NY, November 2006
2. Fundamentals of Neuromechanics by Valero Cuevas,
3. Zatsiorsky, Vladimir M. Kinetics of human motion. Human Kinetics, 2002.
4. Zatsiorsky, Vladimir M. Kinematics of Human Motion. Human Kinetics, 2002.
5. Zatsiorsky, Vladimir, and Boris Prilutsky. Biomechanics of skeletal muscles. Human Kinetics, 2012.