

BME101 Introduction to Biomedical Engineering



Biomechanics

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Dynamics: Projectile motion

- $F = ma$, Newton's second law

$$a = dv/dt$$

$$v = dx/dt, dy/dt$$

- $a_x = 0 > x = vx_0t$
- $a_y = -g > y = vy_0t - 0.5gt^2$

- Dynamics – Angular Momentum,
- $M = d(I\omega)/dt = 0 \Rightarrow I\omega = \text{constant}$, If $I \propto \omega$

- Solid mechanics
 - Determine tension in the muscles
 - Uniform bar under tension
 - Elastic loading
 - Plastic loading

- **Fluid mechanics**
 - Pressure, velocity, friction
 - Forces acting on the arms and legs in swimming
 - Bernoulli equation
 - Conservation of energy

- Airflow, blood flow through lung
- $P = P_0 + \rho gh$
 - P_0 : Reference pressure
 - h : Vertical distance from the reference point
- Bernoulli Equation (conservation of energy)
 - $P_2/\rho + V_2^2/2 + gz_2 = P_1/\rho + V_1^2/2 + gz_1$