Lect 12: Inverse dynamics, joint power and work

How is joint torque used to determine joint power and work?

https://wwrichard.net/tag/biomechanics/
Course roadmap

- Static balance
  - COP and postural control
  - Signal processing
- Movement
  - Quantifying gait cycle
  - Determinants of gait
  - Rigid body musculoskeletal models
    - Inverse kinematics
      - Segment angles, joint $\Theta, \dot{\Theta}, \ddot{\Theta}$
      - Numerical differentiation
    - Inverse dynamics
      - Joint torques, power, work
- Ergonomics
- Muscle
  - Contraction, Hill equation, FLV curves
  - Static optimization and EMG
  - Forward dynamics methods
  - Lagrangian mechanics
  - Technical writing
  - Tendon & ligament
  - Cartilage
  - Bone
Positive moments are extensor or plantarflexor.
Mechanical Energy [J]

- Kinetic energy:
  - Translational
  - Rotational

Potential energy:

U_{grav}

Gravitational pot. energy

http://3.bp.blogspot.com/-cpjvGx655M/Tn_/yaeYhN/AAAAAAAAB0E7g/e3_3WcECxsg/s1600/2-1-energy-008.png
Energy and work

- Kinetic energy:
  - Translational
  - Rotational

\[ KE_{\text{trans}} = \frac{1}{2} mv^2 \]
\[ KE_{\text{rot}} = \frac{1}{2} I \omega^2 \]

- Potential energy:
  - Gravitational
  - Elastic

\[ PE_{\text{grav}} = mgh \]
\[ PE_{\text{elas}} = \frac{1}{2} kx^2 \]

- Energy:

- Work:
+ **Power [watt (W)]:**
Power related to metabolism/mechanical work

- V02 max
- Bike power