University of Idaho

Session 35 - Chap 18 (Concludes Work Energy)

Session 36 - 38 (W 12/1), (M 12/6): Momentum

Sessions 39-40 (Reviews for Final).

Work Energy For Rigid Bodies (Chapters Sections 18.1 - 18.4)

The work energy principle

$$\sum T_1 + \sum U_{1-2} = \sum T_2$$

University of Idaho that applies to a system of particles, also applies to a system of rigid bodies.

Recall: Internal forces contribute no work to U_{1-2} for inextensible cable/rod connections.

Note: Only difference, is now we must account for rotational contributions to T & U_{1-2}.

University of Idaho For a rigid body

$$T = \frac{1}{2} m v_G^2 + \frac{1}{2} I_G \omega^2$$

Work of an External Force

$U_{1-2} = \int \vec{F} \cdot d\vec{r}$, Force in line with motion,
Force oblique to motion, etc...

Work of Weight in Gravity Field

$$U_{1-2} = -W(y_2 - y_1) = -W(\Delta y)$$

y + upward !!

W ↑ Weight of rigid body

University of Idaho **Work of Spring on Rigid Body**

$U_{1-2} = -\frac{1}{2} k (s_2^2 - s_1^2)$ $s = 0$ at free length of spring

Work of an Externally Applied Moment

$$U_{1-2} = \int_{\theta_1}^{\theta_2} M \, d\theta$$

M is an applied moment due to an external force.

~radians

~N·m