INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Název projektu**: Automatizace výrobních procesů ve strojírenství a řemeslech**
Registrační číslo: **CZ.1.07/1.1.30/01.0038**
Příjemce: **SPŠ strojnická a SOŠ profesora Švejcara Plzeň, Klatovská 109**
Tento projekt je spolufinancován Evropskou unií a státním rozpočtem České republiky

Produkt:

Zavádění cizojazyčné terminologie do výuky odborných předmětů a do laboratorních cvičení

DYNAMICS - Force effect in time and in space - Work and energy

Návod v anglickém jazyce

Číslo tématu: **3b**

Monitorovací indikátor: **06.43.10**

INSTRUCTIONS FOR TOPIC: 3b

Created in school year: 2012/2013

Branch: 26-41-M/01 Electrical Engineering - Mechatronics

Subject: Mechanics

Year: 2.

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DYNAMICS - Force effect in time and in space - Work and energy

Type of lesson**:** Theoretical lesson

Teaching aids: Textbook and workbook (Gruber, J. *Dynamika*.)

Lesson objective: Pupil calculates work, uses energetic method to solve simple dynamics problems.

Educational objective: Methodical solution of a problem, task analysis.

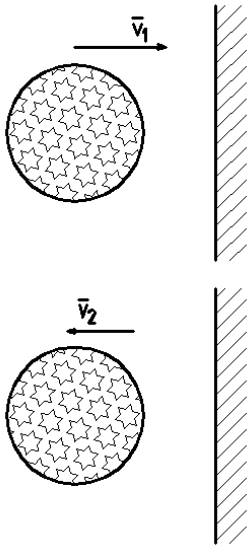
Lesson stages:

1. Revision of the previous lesson

- How is the momentum defined? Is it scalar or vector quantity?
- When is using of relation between impulse and momentum while solving the dynamics task appropriate?
- How is principle of conservation of momentum manifested during the shooting from a rifle?

- Exercise (workbook):

Defined: A ball with the mass m = 0,125 kg is thrown against a vertical wall. The velocity of the ball before an impact to the wall is v_0 = 72 km.h^{-1} and after a bounce v = 15 m.s^{-1}. The ball was in contact with the wall for the period of time t = 0,05 s.



Calculate: momentum H_0 before the impact, momentum H after the bounce and mean value of the force F, a force with which the wall inflicted on the ball.

Momentum before the impact:

Momentum after the bounce:

Force:

2. Motivation

An alternative method of solving dynamic problems representing simplifying if used appropriately. Motivational discussion about principle of conservation of mechanical energy.

3. Explication of the new curriculum

a) Work, relation force – trajectory, work of variable force (spring).

b) Calculation of work during elevation on an inclined plane.

c) Mechanical energy, principle of its conservation, deducation of the velocity of the free fall.

d) Energetic method of solving problems- work of external forces, change of kinetic energy.

e) Work in Earth gravity field (conservative field of force).

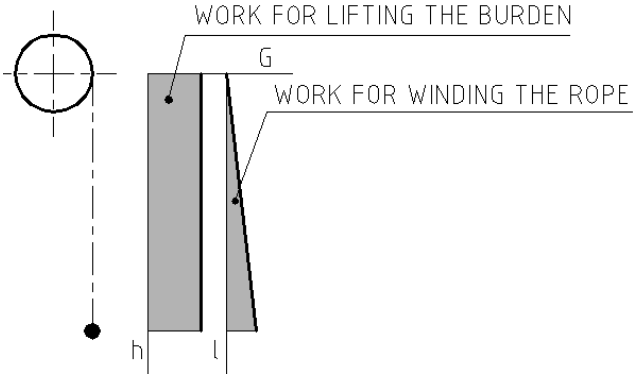
4. Notes in the exercise book

- Highlight the basic knowledge, i.e. definition of concept and the basic calculated relation. Point out the signs in energy equation. Do not substitute the textbook.

5. Exercises

Defined: By compressing spring the work W = 22,3 J was performed. Its rigidity (spring constant) is c = 28 N.cm^{-1}.

Calculate: compression and applied force.



Defined: A rope of lenght l = 5,7 m with a burden of mass m = 50 kg. One metre of the rope has a mass of q = 1,63 kg.

Calculate: work required for lifting the burden and winding the rope.

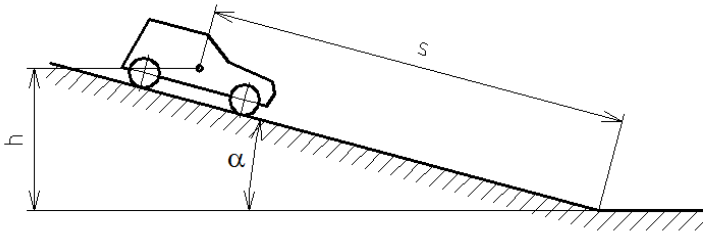
Point out the analogy between both exercises.

6. Homework assignement

- Exercise from the workbook:

Defined: A released car is starting moving by its own weight G = 10 750 N down the slope whose lenght is s = 63 m. After driving through the slope it reaches velocity v_2 = 59 km.h^{-1}.

Calculate: inclination of the slope and velocity v_1 in the middle of the slope. Solve it by energetic method, do not take friction into account.



7. Conclusion

- Questions
- Evaluation of the lesson and activity of pupils in solving problems.

Zdroj:

GRUBER, J., *Mechanika IV- Dynamika*. SPŠS a SOŠ prof. Švejcara, Plzeň. Dostupné z www: http://www.spstr.pilsedu.cz/osobnistranky/josef_gruber/mec_new.html

DYNAMIKA - Dobový a dráhový účinek síly - Práce a energie - DYNAMICS - Force effect in time and in space - Work and energy - slovníček odborných termínů

Vocabulary	Slovníček
dynamika	dynamics
energie	energy
energie kinetická	kinetic energy
energie potenciální	potential energy
hmotnost	mass
hmotnost hmotného bodu	mass of a particle
hmotnost tuhého tělesa	mass of a rigid body
hmotný bod	particle
hybnost	momentum
krouticí moment	torque
mechanická práce	work
motor	engine
ohyb	bending
pohyb	motion
samosvorný	self-locking
síla	force
síla setrvačná	inertia force
silové pole	field of force
silové pole potenciální	conservative field of force
tření	friction
tuhé těleso	rigid body
účinnost	efficiency
účinnost mechanická	mechanical efficiency
výkon	power
výkon síly	power of a force
výkon užitečný	effective power
výkon vstupní (příkon)	input power
zákon zachování hybnosti	principle of conservation of momentum
zákon zachování mech. energie	principle of conservation of mechanical energy