

Course description

Course abbreviation: KFY/FYPY1
 Course name: Physics 1
 Academic Year: 2016/2017

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Printed: 21.05.2018 07:20

Department/Unit /	KFY / FYPY1			Academic Year	2016/2017
Title	Physics 1			Type of completion	Exam
Accredited/Credits	Yes, 2 Cred.			Type of completion	Combined
Number of hours	Přednáška 2 [Hours/Week]			Course credit prior to	NO
Occ/max	Status A	Status B	Status C	Counted into average	YES
Summer semester	0 / -	0 / -	0 / -	Min. (B+C) students	not determined
Winter semester	38 / -	0 / -	0 / -	Repeated registration	NO
Timetable	Yes			Semester taught	Winter semester
Language of instruction	Czech			Internship duration	0
Substituted course	None				
Preclusive courses	N/A				
Prerequisite	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

Reference and coordinate system. Mechanics of fixed element, fixed elements systems, solids and fluids. Principles of conservation. General gravity. Mechanical oscillations. Basics of molecular physics of gases, fluids and solids. Thermodynamic principles.

Requirements on student

Overview of definitions, dimensions and basic principles. Relation of theoretical background and practice. Well-arranged knowledge of definitions in the secondary-school range of mechanics, molecular physics and thermodynamics.

Content

- 1) Mechanics of fixed element (FE)
 Reference and coordinate system, position vector of FE. Distance, instantaneous velocity, instantaneous acceleration. Classification of FE motions. Circle motion of FE. Newton's motion laws. Force and quantity of motion. Force impulse. Dynamics of rectilinear and curvilinear non-uniform motion. Dissipative forces.
- 2) Work and energy
 Mechanical work and energy. The law of mechanical energy conservation. Conservative forces and force fields. Inertial reference system. Galileo's principle of relativity and Galileo's transformation. Non-inertial reference system. Inertia force. Rotating reference system and inertia forces inside.
- 3) Mechanics of fixed elements system and solids
 Fixed midpoint of fixed elements system and reference system of fixed midpoint. Pulse theorems. Laws of momentum and moment of momentum conservation. Isolated system of fixed elements. Movable and circular motion of center of gravity. Center of gravity (COG). Composition of forces affecting COG and their balance. Moment theorem. Simple machines.
- 4) Mechanics of solid
 Motion equation of rotating solid. Moment of inertia. Steiner theorem. Energy of the rotational motion. Motion of balance wheels.
- 5) Mechanics of fluids
 Basic properties of fluids. Pressure in fluid. The equation of balance and fluids statics laws. Stationary flow of ideal fluid. Equation of flow continuity,
- 6) Mechanics of fluids
 Bernoulli's equation. Internal friction of real fluids and their stationary flow. Laminar and turbulent flow. Medium resistance. Basics of flight physics.
- 7) Thermodynamics and molecular physics
 Relationship between thermodynamics and molecular physics. Basic definitions, conception and models. Kinetic theory of matter. Amount of substance. Statistic physics, probability and distribution of density probability, mean value. Thermodynamic system

(phases and components). Thermodynamic equilibrium state.

8) Thermodynamic principles

Internal energy, heat and work. Thermodynamic principles. Calorimetric equation. Entropy, efficiency of thermal machines. Phase transitions, phase diagram (binary and ternary systems). Gibbs rule of phases. Anomalies of water. Clausius-Clapeyron equation.

9) Thermodynamics of irreversible processes

Linear theory of irreversible processes. Transmission phenomena and kinetic equation. Onsager relations of reciprocity, stationary states, fluctuations and stability of systems. Transport processes. Thermal exchange (by conduction, flow and emission).

Diffusion, transfusion and osmosis. Charge transfer. Reactions kinetics.

10) Gases

Ideal and real gas. State equation. Kinetic theory of gases. Internal energy, specific heat and pressure of ideal gas. Dalton's law, air humidity, dew point. Henry's law. Chemical balance constant. Activity and fugacity of gases.

11) Fluids

Structure of fluids. Molecular phenomena in fluids, adhesion and cohesion. Surface tension, capillary pressure, capillary elevation and depression. Surface active substances, wettability, outer angle. Solutions, fusions and mixtures. Colloid solutions, gels.

Raoult's laws.

12) Solids

Structure of solids, Bonds in solids, Crystal defects. Band model. Thermal, magnetic and electric properties of solids.

Luminescence, Mechanical properties, deformation diagram, Hook's law. Deformation of solids in tension, pressure and sliding. plastic deformation.

13) Written examination 2

Prerequisites - other information about course preconditions

none

Competences acquired

The student is familiar with basic definitions, quantities and principles of the mechanics, molecular physics and thermodynamics.

Fields of study

Guarantors and lecturers

- **Guarantors:** RNDr. Libuše Švecová, Ph.D.
- **Lecturer:** RNDr. Libuše Švecová, Ph.D.

Literature

- **Basic:** HALLIDAY, D., aj. *Fyzika. Část 1, 2. Brno: VUTIUM, Praha: PROMETHEUS 2000. ISBN 80-214-1868-0 (VUTIUM), ISBN 81-7196-213-9 (PROMETHEUS).*
- **Basic:** SKLENÁK, L. *Mechanika. Ostrava: učební text katedry fyziky PřF OU 2002.*
- **Basic:** Učební texty fyziky1 - <http://artemis.osu.cz:8080/artemis/view.php?ids=10&idr=74&idc=115> >
- **Recommended:** HORÁK, Z., KRUPKA, I. *Fyzika. Praha: SNTL 1966.*
- **Recommended:** SVOBODA, E., BAKULE, R. *Molekulová fyzika.. Praha, 1992. ISBN 80-200-0025-9.*

Time requirements

Activities	Time requirements for activity [h]
Being present in classes	26
Self-tutoring	20
Preparation for test	9
Consultation of work with the teacher/tutor (incl. electronic)	5
Total:	60

assessment methods

professional knowledge

Written examination

teaching methods**professional knowledge**

Monologic (explanation, lecture, briefing)

Working with text (coursebook, book)

learning outcomes**professional knowledge - knowledge resulting from the course:**

The student is familiar with basic definitions, quantities and principles of the mechanics, molecular physics and thermodynamics.

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Applied Physics	Bachelor	Full-time	Biophysics	1	2014	2016	Povinné předměty	A	1	ZS
Applied Physics	Bachelor	Full-time	Biophysics	1	2012	2016	Povinné předměty	A	1	ZS
Chemistry	Bachelor	Full-time	Chemistry	1	2012	2016	Povinné předměty	A	1	ZS