Applied Physics

for Master study at Textile Engineering faculty

specialization:
Textile engineering

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Lectures

1st – 4th week

1. **Vibration.** Free non-damped vibration. Kinematics and dynamics of vibration, energy of vibration. Summation of vibrations with the same frequency, vector diagram for vibration, addition of different frequency vibrations, beats. Free damped vibration, equation of motion, attenuation. Resonance.

2. **Waves.** Wave equation, harmonic waves, interference, standing waves, wave propagation in space. Energy and intensity of waves, fundamentals of acoustics.

3. **Elastic properties** of isotropic and anisotropic materials. Solid body deformation, impacts of bodies.

4. **Properties of liquids and gasses.** Hydrostatic pressure, Archimedes principle, Pascal law, flow of liquids, continuity equation, Bernoulli equation. Surface tension, viscosity.

Lectures

5^{th} – 7^{th} week

5. **Kinetic theory of gasses**, statistical description, Maxwell-Boltzmann distribution of molecule velocities. Equation of state for an ideal gas, phase diagram, phase equilibrium, Clausius-Clapeyron equation. Air humidity.

6. **Heat, entropy.** First, second and third law of thermodynamics. Relation between internal energy and temperature. Relation between entropy and thermodynamic probability. Heat conductivity, heat conductivity equation, contact temperature.

7. **Electrostatics.** Potential and intensity of electric field and their relationship, electrical forces, energy of electric field, capacity and energy of charged capacitor. Current conduction in liquids and gasses, electrolysis, Faraday law of electrolysis.

Lectures

8^{th} – 10^{th} week

8. **Magnetisms.** Magnetic field of conductor with current and permanent magnets, Biot-Savart law, electromagnetic induction, Faraday law, Ampere law, energy of magnetic field for coil with current. Diamagnetisms, paramagnetisms, ferromagnetisms.

9. **Wave optics**, diffraction and interference of light, dispersion, optical grid. Light polarization, Brewster angle, double refraction.

10. **Reflection and refraction of light**, index of refraction, total refraction. Optical instruments, microscope, magnifying glass, telescope.

Lectures

11^{th} – 12^{th} week

11. **Electromagnetic radiation spectrum**, photometry, light absorption, spectroscopy, infrared radiation, light sources, ultraviolet radiation, X-Ray, gamma radiation. Fundamentals of quantum optics. Planck blackbody radiation law, photoelectric effect, converse photoelectric effect.

12. **Thermal radiation** – light bulb, sun radiation. Bulbs and discharge lamps. Fluorescence and interference of light.

Lectures

13^{th} – 14^{th} week

13. **Atom physics.** Introduction, Rutherford and Bohr model of atom, stimulated radiation, laser. Many electron atoms, periodic table of elements, occupation rules for electron levels in atom, Pauli exclusion principle, Hund principle. Franck –Hertz experiment, ionization energy. Band electron structure in solids and its consequences. Chemical bond – covalent, metallic and ionic. Characteristic properties of metals, semiconductors and dielectrics.

14. **Nuclear physics.** Radioactive decay, nuclear radiation detectors, absorption of nuclear radiation, bond energy of nucleus, dose of radiation, absorbed dose.

Literature

D. C. Giancoli: Physics, Principles with applications, 7th Edition, Pearson 2016

Requirements to pass tutorial

Record – after passing all requirements from tutorial – attendance, homeworks, tests etc. – record given by tutorial assistant

Web of the Dept. of Physics, presentations

https://kfy.fp.tul.cz/

ID: student

Password: proton

Exam

Exam – 2 written tests – problem solving, theory

Higher rank of tutorial evaluation might help in case of indecisive exam result!

Exam dates: enrollment possible from the last week of semester!

Winter 30.9.2019 – 17.1.2020		Summer 24.2. – 29.5.2020
(exams 20.1. – 21.2.2020)		(exams 1.6. – 3.7.2020)
Thu 23.1.2020		
Thu 30.1.2020		Thu 11.6.2020
Thu 6.2.2020	Start at 9:00.	Thu 25.6.2020
Thu 13.2.2020		Thu 2.7.2020
Thu 20.2.2020		
Lecture hall C200		lecture hall C104