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Содержание

The Modular System of Education as a Form of Organization of the Educational Process in the Institution

A.V. Chernykh

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This article describes a form of organization of the educational process in the institution – a modular system of training. Considered the principle of operation of this system as an example the topic «The magnetic field and its basic characteristics». Formulated The basic conclusions reached by the author while working by a modular system.

Keywords: modular system of education, the structure of the module, the levels of complexity, quality knowledge, physical phenomena, physical quantities and laws.

The Specificity of Professional Competences and the Problem of their Diagnosis in Bachelors of Sciences Education

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The article deals with specificity of professional competences, the difficulties of the outcome-based approach implementation in higher educational institutions. The article particularly considers pedagogical diagnosis as an integral part of secondary and higher education.

Keywords: the outcome-based approach, competence, professional competences, training of specialists, diagnosis of professional competences in bachelors of sciences education.

«Electromagnetic Field» – New Volume in the Series "Physics at the Technical University" of Bauman Moscow State Thechnical University

L.K. Martinson, A.N. Morozov, E.V. Smirnov

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The paper considers the structure of the manual written by L.K. Martinson, A.N. Morozov, and E.V. Smirnov «Electromagnetic field», issued by the Department of Physics of the Moscow State Technical University in a series of «Physics at the Technical University», and a brief analysis of the teaching material. Importance of electrodynamics in the course of General Physics of Technical Universities is marked both at forming of general views on nature, and at the use in various technical disciplines, such as electrical engineering, radio engineering,

electronics, etc. Stresses the urgent need for more in-depth study of physics at the Technical University.

Keywords: electromagnetic field, physics at the technical university, course of general physics.

How Does a Magnetic Field set up if a Current in Conductor is Turning on?

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In the solution of problem on the formation of electric and magnetic fields by changing in time current, Maxwell's equations are used, but mostly little-known remarkable formulas O. D. Jefimenko. Formulas represent the solution of Maxwell's tequations, and demonstrate a direct dependence of the $\vec{E}$ and $\vec{B}$ fields and their sources: the charge ρ and current densities $\vec{j}$, as well as their time derivatives $\dot{\rho}$ and $\dot{\vec{j}}$. These formulas not only provide a simpler way than in the case of reliance on Maxwell's equations to obtain the solution of many problems, but do not contribute to the formation of the prejudices, according to which variable electric field is a source of magnetic, and variable magnetic – a source of electric fields.

Keywords: Maxwell's equations, formulas O.D. Jefimenko, formation of electric and magnetic fields by changing in time current.

Lessons of Nanoelectronics. 5. Phonon Heat Current by «Bottom – Up» Approach

Yu.A. Kruglyak

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Ballistic and diffusive phonon heat current is discussed in the frame of the «bottom – up» approach of modern nanoelectronics.

Keywords: nanoelectronics, molecular electronics, bottom-up fashion, heat transfer, photons.

Higgs Boson in the Nobel Prize Bouquets for Modern Elementary Particle Theory

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The article considers the key physical ideas that led to the experimental verification of the Higgs boson. Conceptual problems in the theory of supersymmetry in the context of this discovery are marked. The hypothesis about technicolor nature of the Higgs boson is examined.

Keywords: Higgs boson, Nobel Prize, vacuum, supersymmetry, technihadrons.

Model of Thermonuclear Target Dynamics

A.S. Baryshev, D.N. Zamyslov, E.E. Meshkov, I.A. Novikova,
V.V. Pichugov, V.V. Rudenko[1], G.M. Yanbayev

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In SarFTI NRNU MEPhI a simple model of the dynamics of a thermonuclear target for ICF was developed as part of set of laboratory practical work on gas dynamics. In the model the internal energy of the air in the environment is used as a driver. By virtue of safety of model working with it does not require special tolerances.

Keywords: Workshop on gas dynamics; the dynamics of thermonuclear target ITS; «atmospheric» shock tube; experiment; numerical calculation.

Study of Mechanical Oscillations and Resonance with a Galvanometer

I.N. Fetisov

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A study of mechanical oscillations and resonance with a galvanometer was described.
Keywords: mechanical oscillations in galvanometer, resonance, laboratory work.

Studying of the Bound Oscillations in Physical Practicum on Mechanics

J.Y. Nesterova, K.S. Nesterov, M.A. Nikitin, K.P. Kornev,
V.V. Fedotov

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Authors give the description of the laboratory experiment, allowing to explore bound mechanical oscillations, using imaging in virtual technologies.
Keywords: experiment, physics, mechanics, imaging.

Development of a Technique of Studying of a Normal Dispersion of Light by Means of a Triangular Prism in a Course of the General Physics

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The article analyzes the traditional to the general physics course approach to the study of normal dispersion of light by using a goniometer and a triangular prism. The offered directions of modernization of a traditional technique are realized in the form of computer laboratory work. Recommendations about use of the given technique in a laboratory practical work of a course of the general physics are made.

Keywords: technique of teaching of physics in high school, a normal dispersion of light, physical model, computer tools in education.

To Terminology of Computer Experiment

P.N. Skochilov, E.E. Fiskind

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In article different types of computer experiment, their classification are considered. Compliance between type of computer experiment and the tasks, carried out by the computer is established.

Keywords: computer experiment, computing experiment, virtual experiment, a computerized experiments-time, automated experiment, really-virtual experiment, computer video experiment.

Physical Bases and Achievemets of Modern High Technologies in the Content of Level Preparation of Pedagogical Shots

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The approaches to the selection and development of the maintenance of the problematics of modern high technologies in the conditions of level preparation of students of pedagogical higher education institutions on physics are considered and locate. The special attention is paid to the reflection of key concepts of nanophysics in the content of theoretical and experimental preparation of future teachers.

Keywords: the leading ideas of updating of the content of training, the selection criteria of the subject contents, the formation of basic concepts and nanophysics representations, the development of new fundamental effects and principles of the management of the properties of nanomaterials and instrument structures.

Implementation of Project Method in Practical Physics for Bachelors of Engineering

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The article presents the implementation of project method in organization of practical physics for Bachelors of Engineering. The article provides the examples of active teaching forms in practical physics, which results in individual student quality development and studying Physics in full volume at a limited time resource.

Keywords: project method, competencies, network educational modules in physics, practical physics, grade-rating system.

Kinematics Secrets of Ancient Games. Gorodki

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Objects and phenomena of natural environment seem poorly explored in Russian system of science education. Meanwhile this resource possesses the great motivational potential for studying physics. In particular most ancient games, due to unique interplay between context and content, may serve as the origin and framework for working out open-ended teaching units on mechanics. In this paper the cluster of context sensitive research-based kinematics problems based on «Gorodki» game was constructed. Such problems urge students to concentrate on highlighting goals, developing models, planning experiments, analyzing assumptions and consequences.

Keywords: research-based education, kinematics, ancient games.

Measuring Properties of Physics «Rosatom» Olympiad (for Graduates of High Schools)

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The results of final stage of «Rosatom» Olympiad in physics for high school graduates have been analyzed. The measuring properties of the Olympiad tasks were analyzed, such as: equity of variants, error of measurement. The correspondence between item difficulties and abilities of participants was analyzed. Modern test theory IRT was used. It was proved that the item difficulties were in accordance with the level of abilities of the participants. The used scoring system ensured correct ranking of participants and reliable selection of the Olympiad winners.

Keywords: parallel tests, item difficulty, ability of Olympiad participant, error of measurement.

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