



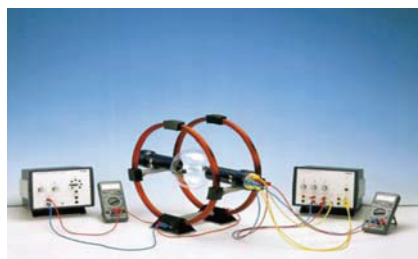
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тел.(495) 673-19-38, 673-20-32, 673-17-28, E-mail: office@rusuchpribor.ru, niokr@rusuchpribor.ru
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The Study of Media with Negative Refractive Index in the General Physics Course

A.A. Mamaluy¹, E.S. Syrkin², I.V. Galushak¹, X.A. Minakova¹

¹ National Technical University «Kharkiv Polytechnic Institute», Kharkov, UL. Frunze, 4 (Ukraine); e-mail: kseniatrushina@list.ru

² B.I. Verkin Institute of Physics of Low Temperatures. , National Academy of Sciences of Ukraine, Kharkov 47 Lenina (Ukraine), e-mail: syrkinyes@yahoo.com

Considering the exceptional importance of the problems, associated with wave's propagations in media with negative refraction, invited to explore this phenomenon reading general physics course to students of technical colleges.

Keywords: media with negative refraction, metamaterials, the group velocity, the Poynting vector, the Cerenkov radiation, the Doppler effect.

Present-day Photonics and Education

Y.L. Kolesnikov, N.V. Nikonorov

Saint-Petersburg National Research University of Information Technologies, Mechanics and Optics; 197101, Saint Petersburg, Kronverkskiy pr., 49;
e-mail: kolesnikov@mail.ifmo.ru, nikonorov@oi.ifmo.ru

A short characteristic of photonics as a new scientific and technological direction has been done. Key directions of researches and innovations in photonics have been shown as well as a world photonic market has been analyzed. A place of photonics in educational process has been shown on an example of National Research University of ITMO.

Keywords: photonics; photonics market; photonics directions; photonics education.

Course «Principles of Contemporary Natural science» for University Students of Physics-Related Majors

V.M. Grabov, V.P. Pronin, E.U. Semenova

Herzen State Pedagogical University; 191186, Saint Petersburg, Moyka, 48;
e-mail: phys@herzen.spb.ru

The paper discusses the current stage of development of the educational course «Principles of contemporary natural science» for university students of physics-related majors. The main conclusion is made that combination of high scientific level and conceptual universalism of educational courses may be achieved by developing courses based on that in physics. However, the content selection, structure and teaching methods for the course «Principles of contemporary natural science» must be different for students that major in physics, chemistry, biology, geography etc. In Herzen State Pedagogical University the course based on such principles is successfully taught for physics students and also for students of other scientific and humanitarian faculties.

Keywords: higher professional education, science education, concepts of contemporary natural science, conceptual universalism.

Formation of Professional Competences of Creative Character in the Methodical System of Experimental Training for Physics Teachers Students

N.V. Kalachev¹, A.V. Smirnov, S.A. Smirnov

Moscow State Pedagogical University, Department of Theory and Methods of Teaching Physics, ¹University of Finance under the Government of the Russian Federation; e-mail: nkalachev@fa.ru, smirnovav@rambler.ru, drvserge@gmail.com

The article argues that the formation of professional competences of creative nature in the field of physical experiment should start already in the Pedagogical University. To this end, the Department of the Theory and Methods of Teaching Physics the Moscow Pedagogical State University within the framework of a special course on designing school physical experiment created workshop on technology creativity of teachers in the development of educational experimental facilities, which is a part of the overall methodological system of experimental training for physics students of pedagogical universities. Main objectives: to teach future teachers to design and establish experimental facilities, gather up the necessary equipment for this purpose and align it between them, configure the collected plants, to promote the development of students' professional skills in the area of physical experiment, in preparation for their creative work with the physical Cabinet, an ability to apply their physical experimental facilities in the educational process. Competences acquired by students during the workshop can be used later during the pedagogical practice and the pedagogical work.

Keywords: teaching physics, professional competence, training of specialists, students, teachers, physical training, physical experiment workshop, development of creative abilities.

Modern View of the Examination of the Second Law of Thermodynamics

V.M. Goldman, V.I. Novoselov

Tobolsk State Social-Pedagogical Academy, e-mail: goldmanvm@yandex.ru, vivnovoselov@yandex.ru

It is suggested while studying the second law of thermodynamics to accept as basic the definition suggested by I. Prigozhin – about nonnegativity of production of entropy in any thermodynamic systems and for arbitrary processes. It is shown how other popular definitions can be generated from it, and which of them can be saved in their classical form, and which require specification and generalization.

Keywords: entropy, flux of entropy, production of entropy, the second law of thermodynamics, normal thermodynamic systems, abnormal thermodynamic systems.

Study of Cyclical Processes in Practical Training

P.S. Bulkin, T.I. Malova, G.A. Mironova

M.V. Lomonosov Moscow State University, Faculty of Physics;
e-mail: mironova-brandt@yandex.ru

In the article the procedure of the study of the cyclical process, which consists of three isoprocesses, is described. In the course of fulfilling the laboratory work the components of energy balance and efficiency of engine are calculated.

Keywords: cyclical processes, the isochoric heating of gas, the isobaric cooling process.

Lessons of Nanoelectronics. 1. Elastic Resistor Model and New Ohm's Law by Bottom – up Approach

Yu.A. Kruglyak¹, N.E. Kruglyak²

¹ Odessa State Environmental University, Odessa, Ukraine; e-mail: quantumnet@yandex.ua

² Odessa National University. I.i. Mechnikov University, Odessa, Ukraine;
e-mail: krtstudio@yandex.ua

Elastic resistor model, ballistic and diffusion transport and new formulation of the Ohm's law are discussed in the frame of the bottom – up approach of modern nanoelectronics.

Keywords: nanoelectronics, molecular electronics, bottom – up, electric current, elastic resistor, conductivity modes, Ohm's law.

On Dependence and Independence Maxwell's Equations

V.I. Tsoy

Physics Department, Saratov State University, 83 Astrakhanskaya Str., 410012, Saratov, Russia; e-mail: TsoyVI@info.sgu.ru

The disagreements concerning number of the independent equations in system of the Maxwell's equations in manuals on electrodynamics are discussed. The equations of static fields with the account of relativistic invariance and Helmholtz theorem about decomposition of a vector field, the wave equations, equations for monochromatic field and transition between the equations for static and not static fields are considered.

Keywords: Maxwell's equations, Helmholtz theorem, relativistic invariance.

Transformation of Nonmonotonic Dependence Formulas, Describing Oscillation Amplitudes

A.N. Luzin

Siberian State Academia of Geodesy,
10 Plakhotnogo st. 630008, Novosibirsk, Russia; e-mail: tyushev@ngs.ru

The transformations of formulas are presented. These formulas are used in physics

textbooks to describe the amplitude of forced mechanical oscillations, oscillation amplitudes of voltage across the resistor, across the capacitor and across the inductor in elementary closed circuit, containing the source of harmonically oscillating voltage. The formulas have been transformed for visual analysis in the vicinity of the extremum.

Keywords: forced mechanical oscillations; electric oscillations; total square isolation; formula for visual analysis in the vicinity of the extremum.

To the History of the General Physical Practicum. The Molecular Physics

V.I. Kozlov

M.V. Lomonosov Moscow State University, 119991, Moscow Vorobiev Hills 1; e-mail: Kozlov1937@mail.ru

In 2009 year is passed hundred years after issue of the first manual to execution of laboratory works by physics of professor Moscow university A.P. Sokolov [1]. After this time in Moscow university and in other higher educational institutions and abroad are created a great number of laboratories works, are dedicated to study of different physical phenomenon and physical laws by means of most various methods. At the physical faculty MSU is created the book [2] according to materials of educational textbooks of different colleges, dedicated to the physical practicum, according to materials of articles in different journals, including the referative journal of physics. In this book is collected the information about laboratories works by mechanics, published for the last hundred years. In this article is present the book, in which are described laboratories works by molecular physics, are published in these years.

Keywords: general physical practicum, physical phenomenon, molecular physics, laboratories work.

Laboratorial Researches of Outers Characteristics of «Land» Galvanic Elements

S.I. Ofitsin

Ryazan State Agrotechnical University named after P.A. Kostychev, e-mail: s.ofitsin@yandex.ru

This scientific work is a component part of research physical and technical and biological processes, for example a creation and exploitation of land's galvanic elements. As a result of this work, they were got complex results, it was showed algorithm of designing research, it was created scientific and laboratorial complex on given theme.

Keywords: ground galvanic elements, electromotive power, current of short-circuit, experimental equipment.

The Young Interferometer of 8-mm Wavelength Range as an Example of the Quasi-Optical Modeling

in the Physics Workshop

V.A. Kolyasnikov, M.V. Yakovlev

Perm National Research Polytechnical University, 614990 Perm, Komsomolsky Av.
29; e-mail: kolyasn@yandex.ru

The article describes laboratory work on wave optics which has the target to demonstrate the interference phenomenon in microwaves range with the point probing of the interference field. Dielectric permittivity measurement results obtained with the use of 8-mm wavelength range Young Interferometer are being analyzed. The advantages of this pattern comparing with 3-sm wavelength Interferometers and wave guide technique are clearly shown. The possible ways of the accuracy increase are being also discussed.

Keywords: laboratory works in physics; microwave interferometry; dielectric permittivity measurement.

Computer Workshop on Studying of System of Electromagnetic Sizes and their Regularities

A.S. Chuyev, N.A. Zadorozhnyi

Baumann' MSTU; e-mail: chuev@mail.ru, nikazador@mail.ru

Presented developed and used in educational process of the system of physical quantities and patterns (PQP) as a physical workshop on the study of the system of regularities of electromagnetic values. The objective of the workshop: an in-depth study of the students of units of measurements, dimensions and the natural relationships in the system of electromagnetic values.

Keywords: physical practice, the system of laws electromagnetic values.

Use of Elements of Distance Learning in the Differentiated Education of Students of Technical Universities

Olga N. Tretiyakova

Moscow Aviation Institute (National Research University);
e-mail: tretiyakova_olga@mail.ru

The article deals with the use of distance learning students of technical high school in the example we have developed 3D-computer lab physics laboratory.

Keywords: computer physics practical work, Internet-technology, computer 3D-modeling, distance education in physics, the software, computer information base.

Remote Monitoring of the Correspondence Faculty Students Training Activity

A.V. Baranov, L.A. Borynyak, B.B. Gorlov, V.V. Davydkov

Novosibirsk State Technical University

Russia, 630092 Novosibirsk, K.Marx Prospekt 20, NSTU; e-mail: baranovav@ngs.ru

The Distance Learning System *Moodle* is used to monitor the current activities of students of the correspondence faculty. Three levels of testing in teaching physics are discussed.

Keywords: monitoring of training activity, Moodle, testing.

The Dynamics of Priorities in Planning Further Employment of the Graduates of Physics Department over a Period of 2005-2011

V.I. Danilchuk, V.Ye. Korobov

Volgograd State Social Pedagogical University; e-mail: dvi@vspu.ru, vek@vspu.ru

The authors of the article have analyzed the dynamics of the choice of further employment among the students of Physics department of Volgograd State Social Pedagogical University since 2006, when the national programme «Education» was put in force. It is pointed out that high prestige of the profession among senior students have been achieved through the measures of the Government for the improvement of school education, social status of teachers, and also strengthening of the resource base of teaching Physics and IT.

Keywords: dynamics; priorities; employment; graduates; National programme «Education».

Implementation Experience of Innovative Scientific-Educational Project «Modern Achievements of Science and Technology»

N.I. Anisimova, I.O. Popova, I.I. Khinich

Herzen State Pedagogical University of Russia

Moyka r. emb., 48, 191186, St. Petersburg, Russia, e-mail: khinitch@gmail.com

Possibilities that arose during the organization of the common project activities of the high school students, their teachers and the Universities' instructors are discussed. Modern achievements of science and technology are proposed as the subject of such project activities.

Keywords: teaching physics, nanotechnologies, scientific and research activities of school students, project activities.

Research Training of Master Students

L.N. Zavarykina, L.V. Koroleva, E.B. Petrova

Moscow Pedagogical State University; e-mail: 1960_15@list.ru

The article discusses the structure of research training offered for master students studying in the program «Modern Natural Science» (Course «Teacher Education»). The concept of the training is based on an innovative combination of two complement components «Scientific Project» and «Laboratory Course «Natural Science»». Content of master students' research

activities acquiring research skills in the framework of the research training components is discussed in full details.

Keywords: education; research training; scientific project; laboratory course «Natural Science»; innovative education technologies; individual educational pathway.

Comprehensive Approach to the Topic «Current Flow in Liquids» in a Secondary School

O.V. Kuznetsova

Ryazan' State University named by S.A. Esenin; e-mail: o.kuznetsova@rsu.edu.ru

The article deals with the study process in a secondary school from the point of view of its organization and management as interacted elements system in terms of the topic «Current flow in liquids» both at usual classes and in the elective courses. All the study levels introduced from the choice of study base, considering pupils' psychological peculiarities, ergo-economics and physics office and school facilities to the monitoring of the study progress and development of basic professional capacities.

Keywords: organization and management of study process, information and communication technologies, virtual labs, the level differentiation.

Methods of Studying the Topic «The Electromagnetic Field of a Uniformly and Rectilinearly Moving Point Electric Charge» in the Physics Course in University

J.S. Pozdnyakova

Branch of V. P. Astafiev Krasnoyarsk State Pedagogical University;
e-mail: pav@atomlink.ru

Since 2007 at V. P. Astafiev Krasnoyarsk State Pedagogical University branch has been carried out the deductive transformation of teaching material of the module «electricity and magnetism», within the limits of the general course of physics. The article deals with the derivation of the expressions of the electric intensity and the field density created by a uniformly and rectilinearly moving charge from the integral form of the Maxwell's equations system. Also the author tries to define place of this task in the structure of the Electricity and Magnetism module.

Key words: innovative teaching technology; Maxwell's equations; electromagnetic field of a uniformly and rectilinearly moving charge; Biot-Savart-Laplace law.

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