Наукові публікації дослідників СумДПУ у Scopus

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Klok, S., **Kornus, A.**, **Kornus, O.**, **Danylchenko, O.**, **Skyba, O.** Tropical nights (1976–2019) as an indicator of climate change in Ukraine (2023). *IOP Conference Series: Earth and Environmental Science*, 1126 (1). doi: 10.1088/1755-1315/1126/1/012023

The article presents the results of an analysis of the number, frequency and intensity of tropical nights in Ukraine. We have selected such weather stations that are located at different latitudes and correspond with the north, west, east, and south as well as the central part of Ukraine. This was done in order to analyse the differences in tropical nights across latitudes. Also we have weather stations located at the approximately one latitude to analyse how tropical nights vary in longitude. Data from weather stations for 1976-2019 were under analysis. We can say that the increase in the minimum air temperature during summer is on the whole territory of Ukraine. This leads to the fact that since the mid-1990s tropical nights begin to be observed in the east of Ukraine, as well as in the south. After 2000, tropical nights also have begun to be observed in the centre and even in the west of Ukraine. Between two half-periods (1976-1997 and 1998-2019) the increase of number of tropical night events in the south of Ukraine (up to 300 cases) is much more significant than the increase in their number in the northwest (up to 20 cases). As well as the frequency, the intensity of tropical nights also increases. There are cases with minimum daily air temperatures above 25°C. The analysis of the North Atlantic Oscillation (NAC) and the Mediterranean (Cairo-Algeria) indices in the context of explaining the tropical night's occurrence in Ukraine turned out to be quite effective.

Kresan, T., Ahmed, A., Pylypaka, S., Volina, T., Semirnenko, S., Trokhaniak, V., **Zakharova, I.** Construction of Spherical Non-Circular Wheels Formed by Symmetrical Arcs of Loxodrome (2023). *Eastern-European Journal of Enterprise Technologies*, 1 (1–121), pp. 44–50. doi: 10.15587/1729-4061.2023.272400

Bevel gears are used to transmit torque between intersecting axes. They demonstrate high reliability and durability of work, as well as a constant gear ratio. The disadvantage of such a transmission is the mutual sliding of the surfaces of the teeth of the gears, which leads to the emergence of friction forces and wear of their working surfaces. In this regard, there is a task to design such bevel gears that would have no slip. Non-circular wheels are understood as a pair of closed curves that rotate around fixed centers and at the same time roll over each other without sliding. They can serve as centroids for the design of cylindrical gears between parallel axes. If the axes of rotation of the wheels intersect, then the gears are called conical. An analog of gears between parallel axes, in which centroids are flat closed curves, for gears with intersecting axes are spherical closed curves. For a bevel gear with a constant gear ratio, such spherical curves are circles on the surface of the sphere, and with a variable gear ratio, spatial spherical curves. This paper considers the construction of closed spherical curves that roll around each other without sliding when they rotate around the axes intersecting in the center of the spheres. These curves are formed from symmetrical arcs of the loxodrome, a curve that crosses all the meridians of the ball at a constant angle. This angle should be 45°, which ensures the intersection of the loxodrome at right angles. Analytical dependences have been derived underlying the calculations of profiles of spherical non-circular wheels and their visualization by means of computer graphics. The results could be used to design non-circular wheels for textile machines, hydraulic machine pumps, pump dispensers.

Prokopenko, O., Kurbatova, T., Khalilova, M., Zerkal, A., Prause, G., Binda, J., Berdiyorov, T., Klapkiv, Y., Sanetra-Półgrabi, S., Komarnitskyi, I. Impact of Investments and R&D Costs in Renewable Energy Technologies on Companies' Profitability Indicators: Assessment and Forecast (2023). *Energies*, 16 (3). doi: 10.3390/en16031021

Renewable energy technologies play a crucial role in solving global energy and environmental issues, and the pace of the energy transition directly depends on improving their efficiency. Presently, the development and implementation of renewable energy systems are ensured mainly through state funding, the possibilities of which are limited. The potential of attracting private investments depends directly on their impact on companies' profitability indicators, and the uncertainty regarding the return on investments is one of the main barriers affecting investors' decision-making. Based on a vector autoregressive model for analysing the stationary time series, the paper explores the impact of long-term investments and research and development costs in renewable energy technologies on the financial performance of ten of the largest companies operating in this field. The study's results showed that investments and spending on research and development positively affect such companies' profitability indicators as earnings before interest, taxes, depreciation and amortisation, earnings before interest and tax, net income, and return on investment. The obtained results can be used to substantiate the economic effectiveness of investments in developing and improving renewable energy technologies when forming the companies' financial policies to support them.

Puzyrov, V., Losyeva, N., Savchenko, N., Nikolaieva, O., **Chashechnikova, O.** Lyapunov Function-Based Approach to Estimate Attractors for a Dynamical System with the Polynomial Right Side (2023). *Lecture Notes in Mechanical Engineering,* pp. 482–494. doi: 10.1007/978-3-031-16651-8_46

Stability analysis is an essential part of the study of the behavior of a dynamic system. Typically, this analysis includes finding the stationary points or limit cycles, determining their stability or instability, and identifying the regions of attraction (RoAs) of attractors. There are several classical methods for obtaining RoAs estimates, which may be divided into Lyapunov and non-Lyapunov methods; at the same time, due to the limitations of existing methods, the identification of a complex RoAs boundary is practically impossible, and it also leads to a high computational cost. The existing methods are quite effective for systems of the second and third orders. However, an increase in the dimension of the system or uncertain mechanical parameters leads to an exponential increase in the required calculations. In this regard, it is essential to design relatively simple algorithms in terms of the number of necessary operations and, at the same time, give acceptable from a practical point of view estimates of RoAs. The present paper deals with the problem of obtaining estimates of the domains of attraction and stability for a nonlinear dynamical system with a polynomial right-hand side. It is based on a particular procedure of polynomial Lyapunov function construction. As an example, this procedure is applied to estimate the domain of attraction for the mechanical system of two coupled oscillators.

Reznik, O., Bondarenko, O., Utkina, M., **Klypa, O.**, Bobrishova, L. Anti-Corruption Transformation Processes in the Conditions of the Judicial Reform in Ukraine Implementation (2023). *International Journal for Court Administration*, 14 (1), pp. 1–16. doi: 10.36745/ijca.400

This article analyses the anti-corruption transformative processes triggered by Ukraine's judicial reform. The subject of the study is the determination of the critical aspects of the success of anti-corruption transformative measures conditioned by the anti-corruption reform in Ukraine. The objectives of the article are to determine the main anti-corruption challenges facing the Ukrainian judicial system and to characterise the main legislative countermeasures. The authors emphasise that

a properly functioning system of courts supports the realisation of many development goals – by protecting human rights, resolving social conflicts, and implementing government policy. However, today the judiciary in Ukraine still needs to meet these principles. One of the crucial aspects of judicial reform in Ukraine is undoubtedly the overcoming of corruption, which significantly distorts the independence of judges and the principle of equality. The article is structured as follows: current challenges of the Ukrainian judiciary: corruption and judicial independence (1); the essence of the primary measures of judicial reform (2); the role of the Constitutional Court of Ukraine in curbing anti-corruption measures of judicial reform (3) and the creation of the Higher Anti-Corruption Court as an anticorruption component of judicial reform. The authors formulated two critical factors for the success of judicial reform. The first factor is the presence of political will and coordinated cooperation between the President of Ukraine and the Verkhovna Rada of Ukraine. The second factor is the active participation of the public in initiating and controlling the implementation of reform measures. © 2023 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Semenets-Orlova, I., Kushnir, V., Rodchenko, L., Chernenko, I., Druz, O., Rudenko, M. Organizational Development and Educational Changes Management in Public Sector (Case of Public Administration During War Time) (2023). *International Journal of Professional Business Review*, 8 (4), doi: 10.26668/businessreview/2023.v8i4.1699

Purpose: The aim of this study is analyze the importance of educational change for the effectiveness of organizational development and the role of organizational development in the processes of human development today, in the context of the information society and extreme social networking. Theoretical framework: Russia's war against Ukraine has pushed up demand for (new) administrative processes. But this did not negate the need for institutions to develop their potential using various, for example digital tools, and to constantly improve the quality of educational services in the context of extreme conditions and extraordinary circumstances. Design/methodology/approach: Development of education creates new opportunities for the development of human potential for extreme social networking. Findings: The approaches of joint creative activity of the participants of the educational process (in the context of security challenges) as effective means that create an unfavorable context for educational changes are determined. It is emphasized that the development of human potential depends on the ability of education to be flexible to the needs of the information society. It is determined that the transformation of the social institute of education requires radical changes in the training of a new generation of managers with a high level of professionalism, culture, innovative creative thinking. Research, Practical & Social implications: It is found out that a set of theories of organizational development is submitted methodologically capacious for creation of conceptual models of management of educational changes. Originality/value: Reasonably scientific bases of educational changes as objects of public management are characterized by tendentiousness of public management of educational changes on the basis of collective nature.

Serdiuk, V., Pavlenko, I., Bolshanina, S., Sklabinskyi, V., Włodarczak, S., Krupińska, A., Matuszak, M., Bielecki, Z., Ochowiak, M. Kinetic Features of Cd and Zn Cathodic Formations in the Membrane Electrolysis Process (2023). *Fluids*, 8 (2). doi: 10.3390/fluids8020074

Chromate and dichromate solutions used for the activation and passivation of cadmium and zinc galvanic coatings of metal products are widely used due to their ability to form corrosion-protective films. Therefore, in this article, we examined the kinetic features of the cathodic deposition of Cd and Zn during membrane electrolysis. As a result of comprehensive experimental and theoretical studies, the features of Cd and Zn cathodic depositions were analyzed under different hydrodynamic

conditions in a submembrane zone of an anolyte. Experimental physicochemical methods such as the experimental analysis of solutions, analytical modeling, and a statistical analysis were used during the research. A regression dependence for evaluating a reaction rate constant was assessed based on the least-square approximation of the proposed model. As a result, the peculiarities of the cathodic formations for Cd and Zn during the membrane electrolysis process were analyzed. The effect of mechanical mixing with different values of the Reynolds number on the deposition of Cd and Zn on a cathode was evaluated. A change in Cd^{2+} and Zn^{2+} ion concentrations was also considered during the research. Overall, the obtained results increased the Cd deposition rate by 2.2 times using an active hydrodynamic environment with the anolyte.

⊘ Sobko, G., **Aparov, A.**, Kovalenko, N., Frantsuz, A., Yermakova, H. Socio-legal Problems of Environment Criminal-legal Protection, Regarding Illegal Deforestation (2023). *Review of Economics and Finance*, 21 (1), pp. 246–258. doi: 10.55365/1923.x2023.21.23

Environment protection from illegal encroachments and prevention of ecological criminal illegality are among the main tasks of the Law of Ukraine on Criminal Liability. The criminal law must ensure the constitutional right of every person from adverse environmental encroachments and guarantee the constitutional protection of natural resources as the basis of human life and activity. Forest ia a environment component has a huge resource potential and performs a variety of environmental, economic, cultural and recreational functions. Recently, a criminal offense in the field of illegal deforestation has become very common in our country (Article 246 of the Criminal Codex of Ukraine). The article analyzes the most common factors and conditions for the growing number of criminal offenses related to illegal deforestation. Ukraine is on the path to devastation. The article analyzes the state of forest plantations change over the past 10 years and trends towards further destruction of the country's forest fund. The article is based not only on the register of court decisions, but also on a questionnaire conducted among forestry workers and police officers involved in the pre- trial investigation of criminal offenses related to illegal deforestation. The legislative materials regarding to the regulation of ecological protection in the field of illegal deforestation are analyzed. The most common criminal offenses concealment schemes are considered, the main criminological factors influencing the spread of criminal offenses related to forest protection are identified. Measures to be taken to stop the spread of these socially dangerous acts against the environment are proposed. © 2023 Better Advances Press. All rights reserved.

⊘ Sobko, G., Topchii, V., Bugera, O., **Ivanii, O.**, Yavorska, T. Bullying: Criminological and Criminal Law Aspects (2023). *Journal of Forensic Psychology Research and Practice*, 23 (3), pp. 227–245. doi: 10.1080/24732850.2022.2026787

The article is devoted to the study of the problems of the emergence of bullying as a social and legal tort. The existence of such a phenomenon in schools and other educational institutions affects the further formation of a person's personality, as a result of which we set ourselves the task of investigating the factors that can influence the formation of personality. We have developed questionnaires, which surveyed 1.570 minors and 234 teachers. Because of the severe mental violence of parents (or those who replace them), the lives of adolescents are destroyed, who in adulthood realizes themselves through criminal elements, by subordinating to themselves the will of another person, and the like. Our analysis of statistical data based on a survey of different groups of people (minors and teachers) gave us the opportunity to identify problematic issues of a socio-legal nature. It is also proposed to criminalize actions related to bullying of students by committed teachers (teacher, pedagogical worker, administration of an educational institution, social educator) in relation to a minor, including a person who instigates, organizes the commission of bullying in relation to a minor or non-adult.