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ON MATHEMATICAL MODELING OF LINEAR SYSTEMS AND PROCESSES

Summary

Mathematical training plays a special role in high-quality university economic education. The economic curriculum is developed with a due regard to modern interdisciplinary ties. The effectiveness of learning any discipline depends on the lecturer's ability to teach it in an accessible and interesting way, as well as on his ability to show the necessity of learning the subject for students' future careers. When teaching Mathematics to future economists, financiers, managers, and ecologists, the lecturer should select and constantly replenish the stock of economic and environmental models, due to which the abstract mathematical concepts are conveyed in economic language. He should also illustrate and permanently emphasize the power of mathematical theory in solving and analyzing the applied problems. The university education in economics and ecology has significant opportunities for to improving students' economic training, in particular by introducing them to the nature of basic mathematical concepts and the necessity to replace intuitive concepts with accurate ones. The quality of such training is closely associated with the quality of the acquired knowledge and the ability to apply it practically, in constructing the mathematical models of real phenomena. In addition, it is a crucial issue of consistent mathematical training of economists.

The simplified versions of real life are referred to as models. The model usually includes the space and time it has arisen from, which are regarded as the components essential for their overall functioning. Once we have correctly identified the problem and set its boundaries, we put forward a hypothesis or a series of hypotheses to test the former. Next, the proposed hypotheses are analyzed and studied. This paper aims to provide the methods of introducing theoretical information and practical problems of constructing and analyzing the mathematical models described by linear differential equations of the first order.

In the course of the investigation, described by linear differential equations and their systems, the method of Euler's integrating factor is used for solving the Cauchy problem. This will enable the students to better understand and master this method when solving more complex differential equations, which come down to the equations in complete differentials. The results of the research are the description of the process, the solution of the applied problems, modeled by linear differential equations of the first order, as well as the application of Euler's method for solving these equations and inequalities.

Using a computer and mathematical modeling, those who know the laws of nature underlying any process or phenomenon, can predict their behavior, understand the directions of their development, the stability of the process, etc.

Today, Mathematical Ecology, Economics, and Management tend to expand the use of computers for solving the problems in their subject areas. Therefore, it is important to develop students' skills and techniques in this field, relying on information-logical modelling, with the use of modern information technologies.

Keywords: mathematical model, linear differential equations, the Method of Euler, equations with a fractional derivative, the Cauchy problem.

Number of sources: 17; formulas: 6.

References:

1. Kolemaev, V.A. (1998) Matematicheskaya ekonomika [Mathematical Economics]. UNITI, Moskva, 240 c. (in Rus.).

2. Shelobaev S.I. (2000) Matematicheskiye metody I modeli v ekonomike, finansah i bisnese [Mathematical Methods in Economics, Finance and Business]. UNITI, Moskva, 367 c. (in Rus.).

3. Samoilenko A.M. (2000) Dyferentsialni modeli. Stiykist [Differential Models. Stability]. Vyshcha shkola, Kyiv, 329 c. (in Ukr.)

4. Dubovyk V.P. (2005) Vyshcha matematyka [Higher Mathematics]. A.S.K., Kyiv,

648 c. (in Ukr.).

5. Drin I.I. (2010) Dyferentsialni rivniannia: metody ta zastosuvannia [Differential Equations: Methods and Application]. Ruta, Chernivtsi, 288 c. (in Ukr.).

6. Shkil M.I. (1986) Vyshcha matematyka [Higher Mathematics]. Vyshcha Shkola, Kyiv, 512 c. (in Ukr.).

7. Shkil M.I. (1985) Vyshcha matematyka [Higher Mathematics]. Vyshcha Shkola, Kyiv, 391 c. (in Ukr.)

8. Matveev N.M. (1967) Metody integrirovaniya obyknovennyh differentsialnyh uravneniy [Methods of Integrating the Ordinary Differential Equations]. Vysshaya shkola, Moskva, 565 c. (in Rus.).

9. Liashenko I.M. (2000) Modeliuvannia biolohichnykh ta ekolohichnykh protsesiv [Modeling of Biological and Ecological Processes]. Kyivskyi universitet, Kyiv, 340 c. (in Ukr.).

10. Stanzhytskyi O.M. (2006) Osnovy matematychnoho modeliuvannia [Basic of Mathematical Modeling]. Kyivskyi universytet, Kyiv, 96 c. (in Ukr.).

11. Krotov V.D. (1982) Osnovy optimalnogo upravleniya [Basics of Optimal Management]. Vysshaya shkola, Moskva, 565 c. (in Rus.).

12. Gail D. (1963) Teoriya lineinyh ekonomicheskih modelei [Theory of Linear Economic Models]. IL, Moskva, 418 c. (in Rus.).

13. Suchasni problemy matematyky (1998) Materialy Mizhnarodnoi naukovo-praktychnoi konferentsii [Contemporary Problems of Mathematics Mat. of Sci. Prac. Conf.]. Chernivtsi, Ukraine, 224 c. (in Ukr.)

14. Matsenko V.H. (2009) Matematychne modeliuvannia [Mathematical Modeling]. Chernivetskyi nats. universytet, Chernivtsi, 519 c. (in Ukr)

15. Hryhorkiv V.S. (2009) Modeliuvannia ekonomiky [Modeling of Economy]. Chernivetskyi nats. Universytet, Chernivtsi, 320 c. (in Ukr)

16. Dychka I.A. (2019) Matematychne modeliuvannia system I protsesiv [Mathematical Modeling of Systems and Processes]. KPI im. Ihoria Sikorskoho, Kyiv, 130 c. (in Ukr)

Schreder M. (2001) Fraktaly, haos, stepennye zakony. Miniatiury iz bezkonechnogo raya [Fractals, Chaos, Degree Laws. Miniatures from Endless Paradise]. NITS "Reguliarnaya i haoticheskaya dinamika", Izhevsk, 528 c. (in Rus.).