



O‘ZBEKISTON RESPUBLIKASI OLIY TA‘LIM,
FAN VA INNOVATSIYALAR VAZIRLIGI
BUXORO MUHANDISLIK-TEKNOLOGIYA
INSTITUTI



**RAQAMLI IQTISODIYOT, ELEKTRON
HUKUMAT VA SUN‘IY INTELLEKT UCHUN
DASTURIY VOSITALAR, AXBOROTLARNI
QAYTA ISHLASHNING ZAMONAVIY USULLARI
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MODELING IN SCIENCE

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Modeling — research of physical phenomena and processes using models; making models of objects (living and non-living systems, engineering constructions, physical, chemical, biological, social processes and design objects). It is divided into physical, mathematical, electrical, cybernetic and other types of modeling. In Physics research is carried out on a model whose physical nature and geometrical structure of the investigated process is the same as the original, but differs from it in terms of quantity (size, speed). Physical modeling is used to check hydraulic structures, aircraft, ships, etc. In mathematical modeling, mathematical expressions of given physical processes are modeled. Electrical modeling is also widespread. It uses active, inductive and capacitive resistances. Cybernetic models have been created to study control processes in living organisms.

Another type of modeling is analog modeling. It is based on the analogy (similarity) of phenomena of different physical nature, but represented by the same mathematical (algebraic, differential, etc.) equations.

Modeling is always used in combination with other scientific and special methods. First of all, modeling is closely related to experimentation. Studying a phenomenon in its model can be considered a special type of experiment.

Chemical reactor modeling is used to predict the results of chemical technology processes in devices of any size under given conditions.

Stochastic modeling is used for some complex phenomena (for example, turbulence, pulsations in the area of discontinuity of air or liquid flow, etc.). It is based on determining the probability of events. Such models do not fully reflect the passage of certain processes in the same event, but give some kind of average,

summary result.

For example, the model of the Earth is a globe, the model of the sky and the stars in it is a planetarium screen, and the photo in the passport can be called the model of the holder of this passport.

Humanity has long been interested in the problems of creating comfortable living conditions and early detection of natural disasters. Therefore, it is natural for mankind to study various phenomena of the outside the world.

Specialists in the field of natural science study only the properties of this or that process that interest them. For example, geologists study the history of the Earth's development, that is, when, where and what animals lived, plants grew, and how the climate changed. This helps them find mineral deposits. But they do not study the history of the development of human society on earth, historians are engaged in this field of study.

Uncertain and incomplete information can be obtained as a result of studying the world around us. But this does not prevent us from flying into space, discovering the secret of the atomic nucleus, mastering the laws of the development of society, and others. Based on them, a model of the studied phenomenon and process is created. The model should reflect their characteristics as fully as possible.

The approximate nature of the model can be manifested in different ways. For example, the accuracy of the instruments used during the experiment affects the accuracy of the obtained result.

Modeling is researching objects of knowledge (physical phenomena and processes) with the help of their models, creating and studying models of existing objects and phenomena.

The modeling method is widely used in modern science. It facilitates the process of scientific research, and in some cases becomes the only means of studying complex objects. Modeling is of great importance in the study of abstract objects, distant objects, very small objects. The modeling method is also used in physics, astronomy, biology, economics to determine only certain properties and relations of the object.

It can be divided into three groups depending on the means of selecting models. These are abstract, physical and biological groups.

Among abstract models related to mathematical, mathematical-logical and similar models are included. Physical models include miniature models, various tools and devices, simulators, etc.

Let's briefly get acquainted with the content of the models.

1. Physical model. The nature and geometric structure of the investigated process is the same as the original, but the models that differ from it in terms of quantity (size, speed, scope), for example, models of airplanes, ships, cars, trains, hydroelectric power plants, etc., are examples of physical models.

2. Mathematical models consist of a mathematical and logical-mathematical description of the laws related to the structure, interaction, and function of living organisms, they are created according to experimental data or on a logical basis,

and then checked by experiment.

Studying the mathematical models of biological phenomena on a computer allows to know in advance the character of the change of the investigated biological process. It should be noted that it is sometimes very difficult to organize and carry out such processes through experience. The creation, improvement and use of mathematical and mathematical-logical models create favorable conditions for the development of mathematical and theoretical biology.

3. The biological model is used to model biological structures, functions and processes specific to various living objects and their parts - molecules, cells, organisms, etc. In biology, mainly three types of models are used. They are biological, physical and mathematical models.

A biological model allows to test a certain condition or disease in humans and animals in the laboratory. In this case, the mechanism of origin, course, and consequences of this condition or disease are studied on the basis of experience. Various methods are used in the biological model: influencing the genetic apparatus, infecting microbes, removing some organs or introducing hormones that are the product of their activity, and other methods. In such models, knowledge in the field of genetics, physiology, pharmacology is arranged.

A range of procedures are used to research this field: manipulation of the genetic apparatus, the cultivation of microbes, the transplantation of certain organs, the production of hormones that are the product of their activity, and other procedures. In these models, sciences in the field of genetics, physiology, pharmacology are applied.

4. Physico-chemical models are the reproduction of biological structures, functions or processes by physical or chemical means.

5. Economic models have been used since the 18th century. In "Economic Tables" by F. Kene, for the first time, an attempt was made to show the formation of the entire process of social reproduction.

Different models are used to study different directions of economic systems. The most general laws of economic development are checked with the help of national economy models. Large economic models are used to analyze and predict the dynamics and ratio of various complex indicators, including national income, employment, consumption, savings, investment indicators. Small economic systems are used in the examination of concrete economic situations, and mathematical models are used in the examination of complex economic systems.

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*Ushbu sertifikat anjumanda ishtirok etganligini va
to'plamda ma'ruzasi nashr etilganligini tasdiqlaydi*

