

**“APPROVED”**

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METHODICAL INSTRUCTIONS  
FOR INDEPENDENT WORK OF STUDENTS DURING PREPARATION  
TO PRACTICAL (SEMINAR) CLASSES AND IN CLASS

Academic subject	Safety of Vital Functions. Bioethics
Module No 1	Safety of Vital Functions. Bioethics
Topic	The theoretical basis of life safety
Year of study	I
Faculty	Dental, Medical
Number of academic hours	2

### 1. Relevance of the topic:

Problems of safety of vital functions in professional activity of modern doctors have increasing practical significance in connection with global tendencies of deterioration of environmental conditions, worsening of person health and occurrence of a large group of ecologically caused diseases.

### 2. The aims of the training course:

To have general knowledge of the topic studied;

To understand, to remember and to use the knowledge received;

To learn the knowledge of environment and environmental factors;

To form the professional experience by reviewing, training and authorizing it.

### 3. Materials for the before-class work and self-preparation work;

3.1 Basic knowledge, experience, skills necessary for studying the topic in connection with other subjects:

	To know	To be able to
Previous disciplines	Determination of homeostasis, stress.	To identify environmental conditions. To identify environmental factors.

### 4. **Tasks for independent work during preparation for the lesson.**

#### 4.1. **A list of the main terms, parameters, characteristics that a student should take when preparing for the class**

Term	Definition
1. Safety	is the degree of freedom from risk or the absence of an unacceptable risk associated with the possibility of causing any harm to human life and health under all conditions of existence.
2. Danger	is the phenomena, processes, objects, information and the people themselves who can cause undesirable consequences and lead to deterioration of the state of health or death of a person, damage to the environment and objects of economic activity.
3. Safety of Life	is a science that studies the problems of safe human being in the environment in the process of various types of its activities (including labor)

#### 4.2. **Theoretical questions to the class:**

1. Historical and development stages of the life safety as a science
2. The subject of "Safety"
3. The main objectives of the subject
4. Basic concepts and definitions of discipline "Safety"
5. Negative factors of environment of vital functions and their influence on the health of man. Classification of factors.
6. The concept of risk.

### 5. **The contents of a theme**

#### **The subject of "Safety". The main objectives of the subject**

#### **History and development stages of the BC as a science**

In ancient times, man has been poorly shielded from adverse living conditions: high and low temperature, natural disasters, experienced shortages of food, it always the danger lay in wait for wounds, injuries or bites of poisonous animals. That first group of dangers that appeared on Earth are **natural hazards**.

The second group of hazards that threaten human began with the lifetime of the planet, were the **actions of other people**. Wars, conflicts, murders, kidnappings, assassinations and other violence that accompanied and escorted nowadays society.

Third group of dangers emanating from objects created by humans, so-called **anthropogenic factors**: machinery, chemicals and explosives, sources of radiation, macro- and micro-organisms, and so on. These dangers associated with deep human desire to know yourself and the world around them, to create wealth and, paradoxically, in search of greater danger.

There are many examples that would seem to indicate that the acquired knowledge through the development of civilization safety people increases. Humanity has overcome the epidemic of typhus, cholera, smallpox, plague, polio. Average life expectancy in the developed world is approaching 80 years and continues to grow. These results were achieved through the development of medicine that has its roots dated back to Hippocrates, who made reform of ancient medicine, and Aristotle, who in those distant times studied conditions.

Humanity began to slow in danger of extinction due to continuous deterioration of the environment and depletion of natural resources. It became clear that to eliminate this danger must see traditional forms of nature and radically reshape economic activity in most countries.

38 th session of the UN General Assembly in 1983 established the International Commission on Environment and Development, which aims to analyze the environment in the context of global perspectives. Based on estimates of authoritative experts in 1987. The commission produced a fundamental study of "Our Common Future". At the present level of objective knowledge it reflected an understanding of the international community severity of social and environmental issues, the need to reorient the global socio- political, economic, technical, technological and cultural development, for the implementation of relevant national and pan- planetary projects.

In 1992, in Rio de Janeiro hosted the UN Conference dedicated to the Concept of sustainable development of the world community. The Conference adopted the document "Agenda XXI Century" and concluded that the need for a global partnership countries to achieve sustainable social, economic and environmental development of the society.

#### **Basic concepts and definitions of discipline "Safety"**

Safety and risk - the central concept in Safety. These multi-faceted concept used in different spheres of human activity, so there are a few of their definitions.

Security - the degree of freedom from risk or no unacceptable risk associated with the ability to cause any harm to life and human health under any conditions of existence.

Protection of housing, job, wealth, health, environment - the main problem being a safe person.

Danger - this phenomena, processes, facilities, information and most people who may cause unwanted consequences and lead to a deterioration of health or death of a person, harm the environment, real economic activity.

Health and Safety - the science that studies the problem of safe human presence in the environment during different types of activities (including work).

This branch of knowledge, scientific and practical work aimed at studying the general laws of danger, their properties, the effects of their impact on the human body, the foundations of protection of health and life of man and his environment from hazards and to develop and implement appropriate means and measures to create and maintain healthy and safe living conditions and human activities both in everyday life and the conditions of production, and in emergency situations.

#### **The purpose of discipline "Safety"**

- determine the content and nature of the basic concepts and terms, which operates the safety of life;
- navigate the methodological tools and methods of life safety;
- provide analysis of the contents of the main components of the system "man - living environment";
- identify risk;
- identify the causes and consequences of hazards;
- classify dangerous, harmful and affecting factors;
- assess the level of risk.

The object of study of "Safety" as a science is a human and the human community, the environment that surrounds it, the process of human interaction with the environment (i.e., vital functions), and the dangers that arise while.

**The task of the subject "Safety" is to:**

- identify potential hazards that identify species, to determine the magnitude and probability of their development;
- determine hazardous, harmful and affecting factors arising from sources such hazards;
- predict the possibility and effects of dangerous and harmful factors on the human body;
- Use regulatory framework protecting the individual and the environment;
- develop and implement measures protection from the effects of dangerous, harmful and damaging factors;
- prevent emergencies, but if they occur to take appropriate decisions and perform actions aimed at their elimination;
- use in their practice socio-political, socio-economic, legal, technical, environmental, medical, preventive and educative measures to ensure healthy and safe living conditions of people in today's environment.

**Classification of hazards**

One of the prerequisites for the development of effective measures to prevent hazards and elimination of their consequences is to identify hazards that clarify the type of hazard and establish its characteristics.

Identification impossible without their classification. The range of dangers - a list of names, dates of possible dangers - of more than 150 items and not considered complete. In some cases, the range consists of dangers to individual objects (companies, departments, jobs etc.).

Classification of hazards designed based on the taxonomy.

Taxonomy - the science of classification and systematization of phenomena, processes and objects. Since the danger is in most cases a complex phenomenon that often has a complex hierarchical structure that has many features, taxonomy play an important role in the organization of scientific knowledge in the field of security of life and thus reveal the nature of the danger.

By origin:

1. natural;
2. man-made;
3. natural and man-made.

Natural hazards - are natural objects, events, nature, natural disasters that can cause harm to humans or pose a threat to life or health (earthquakes, landslides, mudflows, volcanoes, floods, avalanches, storms, hurricanes, heavy rains, hail, fog, ice, lightning, solar and cosmic radiation, dangerous animals, plants, fish, insects, fungi, bacteria, viruses, infectious disease).

Man-made hazards - is primarily dangers associated with the use of vehicles to the operation of material handling equipment using fuel, flammable and explosive substances and materials using processes that occur at elevated temperatures and pressures, using electrical energy chemicals, various types of radiation (ionizing, electromagnetic).

Natural and man-made hazards: smog, acid rain, ozone hole, "greenhouse effect", dust storms, soil erosion, reduction of soil fertility, the occurrence of desertification, landslides, mudflows, earthquakes and other tectonic phenomena arising due to human activities.

By the nature of the action:

1. physical;
2. chemical;
3. biological;
4. physiological.

The physical hazards include: noise, vibration, electromagnetic and ionizing radiation microclimate parameters (temperature, humidity, air mobility), pressure, light levels, dust, air pollution, etc.

To chemical hazards include: poisonous, toxic substances in different phase states (gaseous, liquid or solid).

Biological hazards - it is dangerous and harmful micro- macro- organism, their metabolic products and livelihoods.

Psychophysiological - static and dynamic overload, mental overstrain, monotony of work and emotional stress.

By the time symptoms negative effects on the realization of danger:

1. pulse (solved immediately or in a short period of time);
2. cumulative (characterized by considerable duration).

Under the pulse dangers implied such a negative impact on a person whose habitat and turns directly after the implementation of risk. The level of the negative effects of such hazards are reduced over time.

Cumulative hazard characterized by increased levels of risk in current some period after their implementation.

The structure:

1. simple;
2. derivatives.

As a result, emerging hazards are classified into those that cause fatigue, illness, injury, fatalities.

In terms of localization:

1. associated with the lithosphere (earthquakes, landslides, mud volcanoes);
2. related to the hydrosphere (destructive rains , floods , tsunamis);
3. associated with the atmosphere, (hurricanes, tornadoes)
4. associated with space ( meteorites, comets, solar activity);
5. complex.

By type of damage is inflicted danger:

1. social;
2. technical;
3. environmental ;
4. complex.

In the field of display :

1. production ;
2. military ;
3. road transport ;
4. household;
5. sports .

The nature of human exposure:

1. active;
2. passive.

To include passive dangers that are activated by the energy of human action. They are sharp (stabbing and cut) still objects and elements, surface roughness, on which a person moves, slopes, lifts, a slight friction between adjacent surfaces, one of which is part of the human body, etc.

By the active hazards include those that are implemented as a result of the release of potential energy of objects subject of human activity in vivo or in emergency, unusual situations.

When solving problems of security of life is a major step in forecasting potential and actual hazards analysis in order to assess their level of anticipated negative impact on humans and the environment.

### **The concept of risk. Manage risk.**

Risk - a quantitative characterization of assessing the degree of danger. Risk is the criterion for the realization of danger. Infinitesimal ("null") risk indicates the absence of real danger in the system, and vice versa: the higher the risk, the higher reality of the impact hazard.

The result is a manifestation of the dangers of accidents, accidents, disasters, accompanied by deaths, reducing the length of life, injury and so on.

In order to standardize any effect hazards are define as damage. Every single type of damage is a quantitative expression, such as the number of dead, injured or sick, the area of the infected area, the area of forest that burned, destroyed buildings cost more. The most versatile quantitative

means of determining the damage - it's expensive, that is the definition of damage in monetary terms.

The second, equally important characteristic of danger, to be exact extent possible danger is the frequency with which it can be shown, or risk.

As the degree of acceptability of risk is rejected, acceptable legal limit, excessive:

1. rejected the risk is so low level that it is within the tolerances of the natural (background) level;

2. acceptable level of risk is such that society can accept (allow), including technical, economic and social opportunities at this stage of its development ;

3. maximum allowable risk - is the maximum risk exposure that shall not be exceeded , regardless of the expected outcome ;

4. excessive risk is characterized by extremely high levels , which in most cases leads to negative consequences.

In practice, to achieve zero risk, that absolute security is impossible! Because of this requirement of absolute security that draws its humanity, can turn into a tragedy for the people. Rejected risk at present as it is impossible to provide because of the lack of technical and economic prerequisites for this. Therefore, the modern concept of life safety is based on achieving a reasonable ( acceptable ) risk.

There are the following methods for determining risk:

- Engineering - based on statistics (frequency calculations manifestation dangers probabilistic safety assessment and building " trees " hazards) ;

- Model - based on building models of the impact of hazards both on an individual and on the social and professional groups;

- Expert - followed by the probability of different events defined by experienced specialists-experts ;

- Sociology (Sociometric assessment) - based on a survey of the public and workers.

All of these methods during the definition of risk should be used comprehensively.

Risk Management

The main point of the theory and practice of life safety is the issue of increasing the level of security. The order of priority in the design of any project requires that at the first stages of a product or system in the relevant project as possible were included elements that eliminate the danger. Unfortunately, this is not always possible. If the detected hazard cannot be excluded completely, it is necessary to reduce the likelihood of risk to acceptable levels by choosing the appropriate solution. To achieve this goal, as a rule, any system or situation in several ways.

These paths are:

- total or partial refusal of work, operations and systems that have a high degree of risk;

- replacement of hazardous operations by other , less dangerous ;

- improvement of technical systems and facilities;

- development and use of specific remedies;

- measures of organizational and managerial nature, including its safety oversight, training people on security, promotion of safe work and behavior.

In order to give preference to specific measures and tools or a set of them, compare the costs of these measures and means and level of harm reduction, which is expected as a result of their introduction. Such an approach to reduce the risk of hazards is called risk management.

Some of the dangers that have relatively low levels of risk considered unacceptable because they are fairly easy to control and eliminate. For example, lightning - strike probability is very small, but its outcome - death. Therefore easier to just stay in the room - that all the costs of control.

On the contrary, there are other risks that are considered acceptable, but have great potential risk, because they are difficult or almost impossible to remove. As an example, you can bring actions to launch spacecraft. But in this case the risk is taken that, firstly, it is virtually impossible to remove at this level of space, and secondly, each flying the spaceship opens up new prospects for the development of many areas of science, technology, defense and the economy.

Thus, the cost is not the only and main criteria for acceptable risk. Important role, as shown above, plays an evaluation of the process associated with the identification and control of risk.

To eliminate or reduce the potential impact of pollutants on people and the environment in the event of an accident, natural disaster or accident, the company in accordance with legal requirements and regulations for civil defense and safety shall be processed and approved emergency response plan and the plan (instruction) emergency response (emergency situations). In terms of emergency situations considered possible accidents and other emergency situations of technological and natural origin, predicted impacts are determined measures to prevent, deadlines, and capabilities that are involved in these activities.

In terms of (manual) emergency response (emergency situations) should be listed all possible accidents and other emergencies by the actions of officials and employees during their emergence, professional duties emergency units or employees of other companies, institutions and organizations involved in disaster management.

### **Principles and methods of ensuring safety of human life**

The category of basic life support guidelines include:

1. Continuous maintenance of the physiological processes of the human body, which depends on factors such as air, drinking water, food, heat, light, consumer goods (dwelling, clothing, shoes, etc.).

2. The principles of relationship and interdependence with the environment. Vital functions provided by such environmental factors as a measure of consumption of energy, minerals, food, elements of artificial environments and others.

On the other hand, affects the livelihoods of living environment: changes the parameters of consumption depletes energy, minerals, alters the climate, flora and fauna, pollute the environment.

Because scientific technological progress has not yet reached a development that all processes are safe, trouble-free and zero waste, the likelihood of technological and process management is not excluded.

3. The principle of rational organization of labor for the purpose, time, place and rules. Competent organization of work includes management, principles of organization, goals and objectives, the means of labor, production activities and results of the work. Violations of labor standards, processes, moral and physical deterioration of capital goods tend to lead to accidents.

4. The principle of material incentives in the organization of life. This principle is directly related to productivity, which is defined by the following parameters:

- The human factor (the way of material incentives);
- Performance of production staff;
- The degree of preparedness to work (professional, physiological, psychological).

Some effects on productivity are also individual characteristics of employees, their physiological and psychological capabilities, environmental parameters, technical and organizational conditions.

Violation account the sequence of manufacturing operations, standards and requirements for technical documentation, poor training can also lead to emergency situations.

5. The principle of the protection of health and the limits and conditions of life. To implement this principle, mankind has created special institutions of health care, defense, environmental protection, ethics and so on. Individual institutions as structural parts of life can be created to protect people and the economy in particular (emergency) situations. These include: Civil Defense, Ministry of Emergency Situations, Committee on security and emergency situations and civil defense headquarters.

6. The principle of negative consequences of life. In considering the above mentioned principles were cases in which the livelihoods of certain groups of people and the population in general, accompanied by man-made emergencies, environmental, industrial, natural and military nature.

Methods and measures for the security of life are:

- Development and implementation of national programs and concepts for the safety of the population;
- training of professionals and the general population to prepare for life safety ;
- the introduction of expert support safe life;
- logistical support life safety;

- Development and implementation of security infrastructure of life at different levels on a regional basis;
- stimulate research and project development, enabling to increase the level of life safety.

#### **Tasks for self-check:**

What is the central concept of life safety?

Security  
Technology  
Model  
Risk  
ergonems

What is the central concept of life safety?

Danger  
Technology  
Model  
Risk  
Ergonems  
Safety - the science of  
person  
technical devices  
labor protection  
Emergency  
natural disasters

Life Safety

The science that studies the problems of safety of human presence in the environment in the different types of activity

Science that studies the safety factors to avoid danger.

Science that studies the harmful and harmless factors influencing the creation of a healthy lifestyle.

Science that studies the effects of hazards on the human body to create a secure life.

The science that studies and provides a safe life.

What is the subject of discipline Safety?

The person and the human community, the environment that surrounds it, livelihoods and dangers while there

Features a living organism, their relationships with each other, regulation and adaptation to the environment, origin and development in the evolution and personal development of individuals.

Human life in all its manifestations and forms and at different levels of life

All variety of animate and inanimate, that is an objective reality that exists in space and time, is in constant motion, caused by the interaction of its individual parts

Healthy people (social group population, the population of the region) and external environment

### **7. Literature**

Basic:

1. Гігієна та екологія. - Підручник для студ. / За ред. В. Г. Бардова / Англ. мовою. - Вінниця: Нова книга, 2009. - 688 с. Іл.
2. Vladimir A. Korobchanskiy, Michael P. Vorontsov, Alisa A. Musulbas. - Hygiene and Ecology. - Kontrast Publishing Enterprise, Kharkov, 2006. - P. 162-165.
3. David E. Hunt. Person-Environment Interaction: A Challenge Found Wanting before It Was Tried/ Review of Educational Research, Vol 45(2), 1975, 209-230
4. James B. Rounds, Terence J. Tracey. From Trait-and-Factor to Person-Environment Fit Counseling: Theory and Process. – 1990. – 44 p.
5. Susan P. Kemp, James K. Whittaker, Elizabeth M. Tracy. Person-Environment Practice: The Social Ecology of Interpersonal Helping. – 1997. – 267 p.



Additional:

1. Dr. John Everett Park. Preventive and social medicine. Text-book m/s Banarsidas Bhanot. Publishers 1167 PREM Nagar. Jabalpur, 482001 (India) 1997.
2. Brett I. Cassens, M.D., M.B.A., E.A.C.P. Preventive medicine and Public health. Harwal Publishing. (Philadelphia. Baltimore, Hong Kong, London, Munich, Sydney, Tokyo). A. Waverly Company-1992.
3. English-Russian Glossary of selected terms in preventive toxicology. United Nations environment programme. Centre of international Project, GKNT. M.: 1982 (Interim Document).
4. O. John M. Zast. Public health and human ecology. - 2nd ed. - Me Graw- Hill, 1987.

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