

## HIGHER EDUCATION AND TEACHING MODERN PHYSICS IN IT

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**Annotation:** *In the article some topical issues of teaching modern physics are analyzed about exactly what new courses should be introduced as a special subject for bachelors, masters and teachers of retraining and advanced training courses for teachers of "Physics", theoretical analysis and solutions of issues such as the scope of teaching selected disciplines, what criteria are used in their selection, its name, in particular, the term "modern physics", its content and differences from "classical" physics.*

**Key words:** *education system, reforming the system of higher education, requirements of the state educational standard in the direction of "Physics", curricula, areas of training of pedagogical personnel, the introduction of new special courses, the study of modern physics in a pedagogical university, physics and its development, modern physics, the basics of modern physics, relevant trends in modern physics, "classical" physics, "modern physics", "Physics on the threshold of the third millennium", the main achievements of physical science in a decade, theoretical principles for choosing the main directions of modern physics.*

This work is devoted to modern physics and some topical issues of its teaching in higher education which is the series of previously published works [1. 4]

Great attention is paid to science and education in Uzbekistan alongside with the ongoing socio-economic reforms. For instance, PD of President of the Republic of Uzbekistan Sh.M. Mirziyoyev dated on 20<sup>th</sup> of April, 2017 "On measures to further develop the system of higher education" and PD-5032 dated on 19<sup>th</sup> of March 2021 "On measures to improve the quality of education and research in physics" took the reforms in science and education to a new level. A great number of topical assignments were identified in this article about the development of material and technical base of higher education institutions of the republic in special programs aimed at ensuring the implementation of the above decisions, improving the quality of teaching and methodological teaching staff, improving the quality of teaching physics, to introduce modern teaching methods in the educational process, the selection of gifted students, the training of competitive professionals in the labor market, the development of scientific research and innovation and the practical effectiveness of these tasks. In this regard, the development and implementation of practical measures to support fundamental scientific research in physics, increase the efficiency of the system of training scientific personnel and deepen the integration of "science - education - industry - region" are among the current issues is one of the current issues of today. This is in turn, contributes to the development of fundamental sciences, especially the physical sciences.

It should be noted that physics is one of the fastest growing sciences of nowadays. The highest level of physical discoveries has been made in the last few decades. This has led to the emergence of new powerful theoretical ideas and methods on the one hand and to the creation and use of new scientific instruments, techniques and technologies on the other hand.

Although the results of serious discoveries in the world of physics, science news, research have been widely discussed and debated, they have been partially included in higher and secondary education standards, curricula and plans moreover this process is continuing. In fact, if we talk about physics, schoolchildren and even students study physical phenomena that were discovered before the early 1960s. Only from time to time, it becomes known quickly to the general public, including students and schoolchildren when an open physical phenomenon leads to a technological discovery. Such as ,an example of this is laser physics, which was introduced into the educational process very soon after its opening. However, this is no exception to the rule.

Thus, the broad ideological, experimental, and technical knowledge in which modern physics resides is not known to those who are “assimilators” that knowledge in the future. In schoolchildren and students’ point of view, physics seems to be a frozen system in which even small changes are very rare. The worst one is that the idea of physics is created for teachers, present and future generation and they are passed on to school children. The current situation is one of the main factors leading to a decline in young people's interest in the natural sciences, firstly in physics.

There are several objective and subjective reasons for the lack of sufficient information about modern physics in university and school curricula. The most important objective reason is the complexity of the physical phenomena in the space in which modern science lives. The process of its development shows that the deeper we understand and comprehend nature, the farther we go from it through our own emotions. This fact was noted by Aristotle and in the last two thousand years this situation has never changed. The development of the universal mind and the complexity of the tasks facing humanity are in dynamic balance allowing the civilization of knowledge about nature.

This situation inevitably leads to a delay in teaching a particular subject from its research base. Overall, this is not surprising. This has been the case in the history of science and the only thing we can claim is that this deferment is not too great. However, the relationship between science and education at different stages has allowed this gap to be narrowed.

The difference between scientific and pedagogical ideas about physics is growing again at this stage in the development of physics. In our opinion the reason for this is that the methodology of teaching students and schoolchildren the basics of modern physics is not sufficiently developed.

It’s true that recent publications have appeared [5. 18], a methodology for teaching students through seminars on some issues of modern physics is being developed. However, the use of other traditional teaching methods, primarily lectures related to modern physics is almost non-existent. In addition, the issue of general principles of organizing the teaching of modern physics to students of pedagogical universities in the scientific and methodological literature is almost not studied. Thus, there is appearing a contradiction between the issues of evolving physics and its teaching. It is impossible to implement such training fully through the needs of teaching students the basics of modern physics to create an emotional environment that stimulates their interest in physics at school and to teach modern physics in lectures on special courses, as well as in special internships and through course and diploma work. This contradiction determines the relevance of the research being conducted. How to solve this problem? For example, you can do as the following:

-by adding modern physics issues to the content of the core courses and increasing its volume, this takes more time and is very problematic in the current trend of reducing the number of hours allocated to the observed natural sciences

-implementation of "modern physics" in the schedule. It can also be observed that it currently leads to great difficulties due to the lack of free hours, methodological manuals, trained teachers, etc .;

- introduction of additional elective courses provided for the second generation standards, maintenance of the rest of the system of teaching general and theoretical physics. To our mind this stage is the right choice and the most optimal variant. After all, we do not rule out the other two possibilities but in these cases it takes a relatively longer time to prepare.

The purpose of the research is the process of training physics teachers in pedagogical higher education institutions . The research topic is a method of knowledge formation of physics students of pedagogical higher education institutions in the field of modern physics. The aim of the research is to improve the system of teaching the basics of modern physics by introducing special courses for future physics teachers, taking into account the requirements of the state standard of higher pedagogical education, as well as to develop a model program of one of such special courses (for example, "Physics on the threshold of the third millennium") and to form its methodology. The research is based on the following hypothesis: if you add pedagogy to the system of teaching modern physics in a higher education institution as a key component of teaching special lecture courses on this topic, it will help you:

to form a broad understanding of students about the modern physical picture of the world (a single physical view of the universe), reflecting the latest scientific discoveries and hypotheses that describe, explain and predict the behavior of physical systems in the micro-world, macro-world and mega-worlds;

readiness to teach students lessons which helps to increase the level of scientific readiness of students and stimulate their interest in the natural sciences;

permits students to create competencies that interest them in learning physics for themselves and their future students.

**The main objectives of the study are:**

- analysing the degree to which modern physics is reflected in the educational process of secondary schools and pedagogical higher education institutions on the basis of the study of scientific and methodological literature ;

-conducting relevant surveys on the topic;

-you will develop criteria for selecting the content of teaching materials, taking into account the importance of certain areas of physics for the development of fundamental science, technology and the whole of humanity, as well as psychological and pedagogical features of education based on the analysis of the current state of physical research.

-development of the content, program and methodology of conducting special courses for students of pedagogical universities of modern physics, in particular, a special course on modern physics, in particular, "Physics on the threshold of the third millennium" for students of pedagogical universities.

Introduction of the course developed in the practice of teaching students in several pedagogical higher educational institutions of the Republic of Uzbekistan allows to conduct pedagogical surveys, pedagogical examination of the effectiveness of students' study of the nature of physical phenomena related to modern physics. Additionally, it will be possible to determine the possibility of experimental verification of the research hypothesis in the processes.

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