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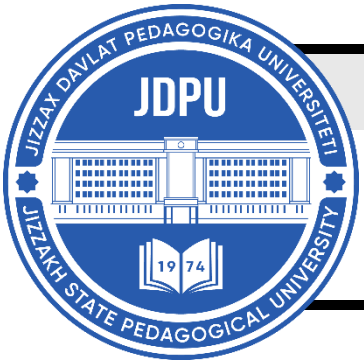

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THE SYSTEM OF DESIGNING AND TEACHING PHYSICS IN TECHNICAL HIGHER EDUCATIONAL INSTITUTIONS

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ABOUT ARTICLE

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Abstract: The article is devoted to the optimization of the process of teaching semiconductor physics to future engineers. The authors determined the goals and objectives of the semiconductor physics course; substantiates the importance of discipline in the system of training engineering personnel; an analysis of works in the field related to the issue of improving the teaching of semiconductor physics in higher engineering educational institutions was carried out. The authors propose to apply a systematic approach to optimizing the process of teaching semiconductor physics, which makes it possible to organize it with the highest quality for the formation of a professionally qualified, competitive specialist.

INTRODUCTION

Modernization of the Uzbek higher education system is an integral part of global transformations in the economic and social spheres of the Uzbek society, occurring over the past two decades, and is aimed at achieving the level of world standards and ensuring the competitiveness of Uzbek education in the global educational space.

Structural changes in education include the transition to a two-level system of training specialists (bachelor's-master's), corresponding to the current international practice of organizing the educational process and designed to enhance its effectiveness.

The second level of higher education, magistracy, trains specialists capable of solving the most complex problems of professional activity, prepared for research activities and independent

analytical work, based on the staffing needs of the economy and the social sphere[1].

MATERIALS AND METHODS

Semiconductor physics is one of the key areas of modern physics that determine scientific and technological progress. Theoretical and experimental methods developed in semiconductor physics are widely used in research carried out in priority areas of science and technology, such as micro- and nanoelectronics, materials science, semiconductor instrumentation, and medicine. All this makes the training of highly qualified specialists in this area relevant.

Semiconductor physics currently includes numerous areas that cannot be covered within the framework of a single master's program. When developing this program, it was taken into account which topics of research in the field of semiconductor physics are most represented at the Faculty of Physics of the State University. These areas include: semiconductor materials science, radiation physics of semiconductors, theory of growth and doping of crystals and films, theory of electronic and optical properties of semiconductor nanostructures.

The educational process is fully provided with computers, software in accordance with the content of the curriculum [2].

The faculty has:

- four computer classes equipped with a sufficient number of computers connected by a local network and having Internet access. The required licensed software is installed on all computers used in the classroom and for research work of students. Classes are equipped with presentation equipment, there is an interactive whiteboard - two educational laboratories for student physical practice, equipped with modern laboratory complexes, computers, equipment and components necessary for automating a physical experiment;

- a physical office with unique demonstration equipment;

- modern telecommunications equipment that allows receiving and transmitting educational and scientific information at various levels.

The master's program regulates the goals, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of training a graduate in this area of training and includes: curriculum, work programs of disciplines (modules) and other materials that ensure the required quality of training for students, as well as practice programs, a calendar curriculum and methodological materials that ensure the implementation of appropriate educational technology.

The preparation necessary for the development of the master's program involves knowledge and ability to use, to the extent provided for by the standard, in general humanitarian and socio-economic, mathematical, natural science and general professional disciplines:

– basic theories in the field of humanities and socio-economic sciences;

- mathematical analysis, theory of functions of a complex variable, analytic geometry, vector and tensor analysis, differential and integral equations, calculus of variations, probability theory and mathematical statistics, non-linear equations of mathematical physics;

– basic concepts, laws and models of mechanics, molecular physics, electricity and magnetism, optics, atomic physics, physics of the atomic nucleus and particles, vibrations and waves, quantum mechanics, electrodynamics, thermodynamics and statistical physics, methods of theoretical and experimental research in physics;

– current state, theoretical work and results of experiments in the chosen field of research, phenomena and methods of research in the scope of disciplines of specializations;

— fundamental phenomena and effects in the field of physics, experimental, theoretical and computer research methods in this field;

– crystallography, thermodynamics of phase equilibria and kinetics of phase transitions, fundamentals of group theory, fundamentals of X-ray diffraction

analysis, fundamentals of solid state physics,

physics of semiconductors, optics of semiconductors, fundamentals of physical materials science of semiconductors, fundamentals of the theory of crystal growth, fundamentals of semiconductor physics devices, modern computer software;

— the foundations of ecology and human health, the structure of ecosystems and the biosphere, the interaction between man and the environment, environmental principles of nature conservation and rational nature management. Admission rules are annually established by the decision of the Academic Council of the University [3-4].

The list of entrance examinations and required documents is determined by the Rules for Admission to the University.

Characteristics of the professional activity of a graduate of the master's program.

Education in the magistracy is carried out in accordance with the individual work plan of the undergraduate student, developed with the participation of the scientific supervisor of the undergraduate and the scientific supervisor of the master's program, taking into account the wishes of the undergraduate. The individual curriculum of the undergraduate is approved by the Academic Council of the Faculty of Physics [5-6].

RESULTS AND DISCUSSION

The Master of Physics is prepared for activities that require in-depth fundamental and professional training, including research work and

pedagogical activity. Preparation for the master's program "Physics of Semiconductors" allows graduates to:

– to conduct scientific research in the field of semiconductor physics and microelectronics

and related fields of modern science;

— formulate new tasks arising in the course of scientific research and master new theories and research methods;

— skillfully generalize and process the results of scientific research at the

modern level using high-performance information technologies;

– work with scientific literature and periodicals, use Internet resources to collect, process and disseminate interdisciplinary knowledge in the field of physics and technology semiconductors, microelectronics;

– carry out modeling of processes and phenomena based on standard packages of computer-aided design and research, use special information and educational systems and environments to create educational and methodological complexes and electronic educational resources; use communication systems and communication technologies for the transmission of scientific and educational information;

– independently prepare materials for publication in domestic and foreign publications, participate in scientific conferences, draw up reports on research work;

— introduce information resources into the practice of scientific and educational institutions.

Tasks of professional activity: a) research activities:

– preparation and conduct of scientific research in accordance with modern tasks, directions and methods of studying the problems posed;

— formulation of new tasks arising in the course of scientific research;

– work with scientific literature using new information technologies, qualified generalization and processing of scientific research results, mastering

new theories and research methods, monitoring of scientific periodicals; – conducting theoretical research on a given topic;

- selection of the necessary research methods;

– analysis of the received scientific information using modern computer technologies and resources.

b) scientific and innovative activity:

— application of the results of scientific research in innovative activities;

— development of new methods of engineering and technological activities; – participation in the formulation of new tasks and the development of new

approaches in scientific and innovative research;

– processing and analysis of the obtained data using modern information technologies;

c) organizational and managerial activities:

– participation in the organization of research and scientific and innovative work, control over compliance with safety regulations;

– participation in the organization of seminars, conferences;

– independent preparation of materials for abstracts, publications in domestic and foreign publications, participation in scientific conferences, preparation of reports on research work;

– participation in the preparation of applications for grant competitions and the preparation of scientific and technical projects, reports and patents;

– participation in the organization of the infrastructure of enterprises, including information and technological:

d) pedagogical educational activities:

– preparation and conduct of seminars and laboratory workshops: – management of scientific work of bachelors:

— conducting circle classes on modern problems of semiconductor physics. Research work. (Attachment 1)

Research practice is designed to familiarize students with current problems and methods of semiconductor physics, microelectronics and them

applications, modern telecommunications and information and educational environments for the consolidation and specific application of knowledge gained as a result learning. Research practice is carried out at the Department of Semiconductor Physics and its branches, in research laboratories of academic institutions, in budgetary and commercial organizations of the high-tech sector of the modern economy, associated with the use of methods of semiconductor physics and technology [7-10].

The purpose of the research practice is to conduct research by the student in accordance with the topic of the master's thesis, work in the conditions of the activities of research and production teams.

Practice objectives:

– mastering research skills in the field of semiconductor physics, microelectronics;

– acquaintance with modern information and educational environments, acquiring skills to work with them;

– collection of factual material on the topic of the master's thesis. The general management of the practice is carried out by the head of the Department of Semiconductor Physics. Each student is assigned to a supervisor who is appointed the decision of the department. The head can be a teacher of the department or its branch, who is the supervisor of the master's thesis, the curator of the practice is an employee of a university or enterprise unit conducting research on a problem of interest. The curator of the practice helps the student, mainly in mastering the

techniques. For each student, the supervisor draws up an individual plan and schedule work in accordance with the theme of the master's thesis. The timing of the practice is not clearly defined. It takes place in parallel with the classroom. According to the results practice student reports at the meeting of the department. The supervisor evaluates the results of the research practice. The decision on the final assessment is made by the staff of the department and recorded in the minutes of the department meeting and the diary of research practice. In addition, during the academic year, the student speaks several times at special seminars of the team in which he practices.

A student who has completed a research practice must:

- know the main activities and achievements of the team to which he is attached;

– get acquainted with the special literature on the topic of research monographs, scientific articles, Internet resources;

- to gain skills in working with software, to master the technologies of working on the problem under study.

The implementation of the main educational program for the preparation of a master is provided by pedagogical personnel with a basic education corresponding to the profile of the discipline being taught and an appropriate qualification (academic degree), systematically engaged in research and scientific and methodological activities.

CONCLUSION

In all disciplines of general scientific and professional cycles, lecturers are professors and associate professors who have a doctorate or candidate of science degree in the specialty of the discipline. Teachers who do not have a degree, but who have experience working with students in this discipline, may be allowed to teach at seminars and laboratory classes.

The share of scientific and pedagogical workers (in terms of rates reduced to integer values) with an education corresponding to the profile of the discipline (module) taught in the total number of scientific and pedagogical workers implementing the main educational program is - 90%.

The share of scientific and pedagogical workers (in terms of rates reduced to integer values) who have an academic degree (including an academic degree awarded abroad and recognized in the republic) and (or) an academic title (including an academic title obtained abroad and recognized in the republic), in the total number of scientific and pedagogical workers implementing the main educational program is - 70%

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