CATALOGUE OF ELECTIVE DISCIPLINES
MASTER'S LEVEL

The abbreviated name of the cycles of disciplines	Name of disciplines and their main sections	The complexity of all loans
BD 1	**CYCLE OF BASIC DISCIPLINES (BD)**	**35**
OC 1.2	**OPTIONAL COMPONENT (OC)**	**15**
1	**Experimental methods in thermophysics**	**5**
	The purpose of mastering the discipline is to study the methods of experimental research in thermal physics (planning, formulation and processing of the experiment). Direct and indirect measurements. Methods for determining the density of solids. Stationary and non-stationary methods for determining thermal conductivity. Statistical and dynamic measurements. Pyrometry. Light and radiation pyrometry.	
2	**Computational experiment and computer graphic design.**	**5**
	He knows methods of studying physical processes using mathematical modeling and scientific computer graphics for visual presentation of the results of a computational experiment using computer graphics and its design. The tasks of studying the discipline are obtaining practical skills for constructing a mathematical model of physical processes and its numerical research, programming the basic mathematical algorithms used in modeling physical phenomena. Visualization of experimental data in the form of graphs, animation using computer graphic design.	
3	**Physical principles and methods of nanotechnology**	**5**
	The history of the development of nanotechnology. Dimensional effects in nanotechnology. Carbon based structures. Preparation of carbon nanostructures. The special role of carbon in the nanoworld. Fullerene is a new allotropic form of carbon. Carbon nanotubes. The use of nanomaterials. From microelectronics to nanoelectronics. Quantum dots. Quantum pits. Quantum wires. Nanomaterials with special physical properties. Electronic devices based on nanoobjects. Nanomaterials and their processing methods.	
	CYCLE OF PROFILE DISCIPLINES	**49**
	OPTIONAL COMPONENT (OC)	**20**
1	**Basic principles of modern physics**	**5**
	The essence of scientific knowledge and its development. The development of physical principles and laws. Modern scientific picture of the world. Quantum determinism. Bohr addition principle. Great unification Unification of electroslap and strong interactions. Modern problems of quantum physical phenomena. Quantum physics of complex systems. Fundamental laws of physics. Elementary particles and fields.	
2	**Physics of energy processes**	**5**

	Kinds of energy, atomic energy - problems and development prospects. Nuclear reactors and nuclear technology. Modern data and theories about the evolution and development of the universe. Energy processes on the sun. Nuclear systems, decays, weak interaction. Thermonuclear reactions. Radiation and spectra of atoms and molecules. The interaction of particles and fields. High energy charged particles and their interaction with matter. The energy spectrum and composition of the primary cosmic radiation recorded on Earth.	
3	**The evolution of the universe and the problems of nuclear astrophysics**	**5**
	Brief information from modern cosmology, data on the distribution of matter, microwave background, Hubble constant, age of the Universe, initial nucleosynthesis, formation of stars and galaxies, star energy and nucleosynthesis, proton and neutron capture, nuclear reactions in stars, methods for analyzing astrophysical reactions, supernovae, star evolution, collapse, cosmic rays, processes in the upper atmosphere, neutrino astronomy, neutrino oscillations, dark matter and dark energy, open questions of modern astrophysics.	
4	**Variational principles of classical mechanics**	**5**
	Variation of coordinates. Virtual relocation. The principle of exemption. Perfect connections. The principle of virtual movements. Principle d'Alembert. The principle of least coercion (Gauss Principle). The principle of the stationary action of Hamilton. Ostrogradsky principle. Principle of stationary action Lagrange. Principle of stationary action of Maupertuis. Principle of stationary action of Jacobi.	