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SUMMARIES OF THE COURSES

for the master's program

«Heritage Science»

Educational direction

12.04.01 «Instrumentation Technology»

«Social Communication in Professional Environment»

The main objective of the course is to develop the ability of students to critical analysis of specific communicative practices and situations of interpersonal interaction and also management skills of communicative behavior in the business interaction. Specific topics are focused on basic communication skills in a business environment, techniques of group management and of making group decisions, the rules of business written communication and business telephone communication.

«Information Technologies in Instrumentation»

«History of Science and Engineering in Instrumentation»

«Commercialization of Results of Scientific Research and Development»

Commercialization of the research work results is the process of involving them in the economic (commercial) turnover in order to ensure the innovative development of the national and international economy. The relevance of this discipline is due to the need to modernize the economy in the context of changing the existing technological structure based on the realization of the potential of high-tech branches of science and technology, including the «Digital Economy» program. The development and implementation of the research work results in the economic activities of organizations and enterprises is one of the key success factors for economic transformations. The main goal of this discipline is to form a complex of knowledge, skills and practical skills of developing a business plan for the commercialization of innovative ideas in the form of creating new or improved types of products, goods, works and services studied in the course of R & D

undergraduates. Mastering a phased methodology for business planning and design of various innovative projects will ensure the acquisition of competencies required in solving the problems of outputting the results to sales markets and assessing their economic efficiency.

«Modern Problems of Electronics and Microprocessor Systems in Instrument Making»

«Russian as a Foreign Language»

The discipline is intended for education of master's degree non-philological foreign students, who have the bachelor diploma of Russian institute of higher education and have the knowledge of Russian Language corresponding to the B 2 level. The program includes requirements for language knowledge level in different types of speech activity as well as grammar and speech material.

The mastering of this program will allow the foreign students to handle their communicative needs in educational, social and cultural sphere, will produce the base for successful learning of special subjects, and, as a result – for successful presentation of a thesis.

The Russian Language course for master's degree students must ensure the forming of a graduate's communicative competence on the level sufficient for professional activity in Russian Language. The education is realized on the source of general scientific, country-specific, literary, social and political texts.

«Foreign Language»

This program is pointed on providing training courses for foreign citizens who had not studied the Russian language before. It includes language and speech models based on the requirements for the Elementary certification level. Achieving this level in Russian will satisfy the foreign students' basic communicative demands in social and cultural as well as in educational spheres of communication.

The content of the program involves implementation of flexible training models, depending on the communicative purposes, native language and students' individual features.

«Materials of Cultural Heritage Objects»

The objectives of this course is to provide information on the properties of the most common minerals and rocks as well some metals and alloys, which are used in architecture and arts and crafts. Basic knowledge on fundamentals of mineralogy (including chemical bonds and crystal structures, crystal growth, the physical properties of minerals and mineral identification techniques) and petrography (the different groups of rock-forming minerals, and classification of rocks based on their mineral contents and textures) are discussed. Besides, the basic laws of mineral formation in natural and technological processes are given.

«Environmental Impact on Materials, Ageing and Deterioration»

This course gives to students basic information about the environmental risk to cultural property caused by physical, chemical and biological factors. Also students will study impact of environmental factors of natural and anthropogenic nature. The course provides general information about environmental monitoring as one of the most effective modern instrument in the field of Cultural Heritage preservation around the world. In addition, the course includes practical laboratory works that allows one to master the methods of assessing the microclimate in the premises for the sustainable protection of CH objects.

«Chemistry in Restoration»

This discipline involves the study of the chemical properties of both restored and restoration materials used in the conservation and restoration of various objects of cultural heritage. The diversity of the nature of these materials determines the problems that restorers encounter in the process of their activities. The objectives of this discipline are the development of the theoretical base, which includes questions of general, inorganic, organic, physic-chemical, colloidal and analytical

chemistry, as well as the acquisition of practical skills in working with chemical compounds necessary for both research and restoration work itself.

«Biology in Restoration»

The objectives of this course is to provide information on the theoretical aspects of the of materials biodeterioration problem, methods for evaluating and studying bio-damage of monument materials, mechanisms of destruction processes in the anthropogenic environment and protection of materials from degradation in restoration practice. The role of microorganisms (microscopic fungi, bacteria and algae) in the destruction of monuments in different environment (in the open air in different climates, in the conditions of Museum storage) is discussed. The course will cover examples of biological deterioration to Cultural Heritage objects created from various materials: natural and artificial stone, wood, paper, etc. Special attention is paid to the interaction of biological and physical-chemical factors in the destruction of materials.

«Physical Non-destructive Methods of Examining of CH Objects»

This course gives a basic knowledge about physical principles and applications of main kinds of non-destructive methods of examining of Cultural Heritage objects based on the use of X-rays, acoustic and electromagnetic waves. Among non-destructive techniques Infrared Thermography, Nuclear Magnetic Resonance, X-ray Digital Radiography and 3D Computed Tomography will be considered. Also basic knowledge of Ion Beam Analytical techniques, including PIXE (Particle Induced X-ray Emission), PIGE (Particle Induced Gamma-ray Emission) and RBS (Rutherford Backscattering Spectrometry) will be discussed.

«Opto-electronic Techniques for CH Materials Characterization»

The course covers the most widely used methods, techniques and equipment for materials characterization such as light photometry, UV/Vis spectrometry, fluorescence spectroscopy, Fourier transform infrared spectrometry (FTIR), Raman spectroscopy, ellipsometry, scanning electron microscopy (SEM), atomic force

microscopy (AFM), X-ray diffraction analysis (XRD) and some others. The course is focused on the basic physical principles, advantages and limitations of each method and their practical application for the investigation and characterization of Cultural Heritage objects.

«Introduction in Heritage Objects Conservation»

The course is focused at basic ideas of conservation/restoration science and practice. A short excursus to the history of conservation theory and practice is aimed onto deeper understanding of its current ideas and methods. Definitions between operative and preventive conservation are discussed. Methodology and methods of practical conservation/restoration are analyzed, traditional and innovative ones being compared. The question of professional ethics in artworks restoration is one more essential topic of the course.

«Laser Techniques in Restoration and Analysis of Artworks»

This course gives to students a basic information about the use of laser techniques in Cultural Heritage preservation. Special attention is paid to consideration of laser cleaning of artworks. Basic physical principles of laser cleaning technology are considered and most important case studies connected with cleaning of CH objects created from different materials are overviewed. Use of 3D laser scanning for documentation, reconstruction and replication of CH objects is considered too. Furthermore, information about physical basics and practical use of other laser measuring techniques (LIBS, LIF, Laser Doppler Vibrometry and others) intended for analysis and non-destructive testing of artworks is presented.

«Computer Methods Applications in CH Preservation»

The purpose of this course is to study the impact of computer technology on art, as well as the specifics of the interaction between art and science and the results of this interaction. The course considers the use of information technologies for study and restoration of artworks, including computer reconstruction of lost

parts of Cultural Heritage objects, as well as their archiving, museification and digitization (3D laser scanning, digital photography in the infrared range, etc.) and creation of copies. In addition, the use of computer methods for educational work (virtual museum) and scientific research of artworks (including their authentication and dating) is considered. The issues connected with introducing the blockchain technology to the art market using the case studies of use of new services, platforms and crypto auctions are also discussed.

«Interdisciplinary Project «Development and Design of Laser and Optoelectronic Systems for Study of CH Objects»»

«Brief History of Art»

Brief history of art course serves to navigate in diverse historic styles in art, as ability to distinguish general styles is an obligatory skill in expertise and attribution of art pieces. The course is aimed at formation of skills of study of objects of art in their historical development and historical contexts. Another skill to be formed is the ability to compare different periods in art history and different groups of artworks belonging to different geographical and chronological locations. As for typological groups of artworks, general division is one to works of fine and decorative art.

«Expertise and attribution of artworks»

Since correct examination and attribution of artworks in most cases is possible only with a combination of various analytical methods, the course focuses on the consideration of art criticism methods of examination and attribution of works of art. None artwork cannot be attributed if it is not analyzed in terms of its state of preservation, technique of creation, composition, origin, previous restorations, and so on. Therefore, the course includes the study of various methods of analysis of fine and decorative arts. In particular, since stylistic analysis is a mandatory part of this process, the course includes consideration of the basic concepts of composition in the visual arts. Important features of existence, origin

and restoration that serve as indirect proof of the authenticity of an art object and should be analyzed in the process of attribution are also studied in this course.

«Academic Internship (Project Design)»

Training practice of masters of the 1st course provides development and fixing of professional knowledge, the skills obtained by them during training in a bachelor degree in the field of conducting independent research, design and production and technological work.

«Internship (Research Project)»

Field experience (R & D) is intended to consolidate the professional knowledge obtained by students in the learning process and practical skills of conducting independent scientific research, development and production work.

«Internship (Pre-degree Internship)»

Undergraduate practice is directed on expansion of the professional knowledge and skills obtained by them in the course of training, conducting necessary researches and selection of required data needed for performance of the final qualification work.

«State Final Examination»

The State final attestation includes defense of the graduation qualification work. The State final attestation is the last mastering stage of the basic educational program.

The training level of graduates for performance of their professional tasks and compliance of their training with the requirements of the State Standard are assessed in the course of the State final attestation.

«Laser Physics»

«Laser Diodes and Optoelectronics»