Template

SSC-based Objective-Module Matrix

TC 05

Materials Science, Physical Technologies

Master Degree Educational Programme 7M05301 – Applied and Engineering Physics (Master)

ASIIN Subject-Specific Criteria (SSC)	Learning Outcomes of the Study Programme	Corresponding Modules
Knowledge, comprehension and application Graduates have		
profound knowledge and in-depth comprehension of the subject-specific fundamentals of the main focus of their degree programme (theory and practice),	LO1. Assess opportunities and conditions for commercialization and develop enterprise strategies in engineering physics, computer simulation of physical processes and green energy.	Foreign Language (Professional); History and Philosophy of Science; Higher School Pedagogy; Psychology of Management;
advanced knowledge of related subject areas,	LO2. Integrate scientific, engineering and international experience into education, production, design and research	Thermodynamics; Solid State Physics and Crystallography; Materials Science and Advanced Materials Technology; Physical and Chemical Bases of Materials; Physics of the Atom and Atomic Nucleus;
developed a critical awareness of new insights in their discipline,	LO6. Demonstrate professional knowledge and solve engineering problems in interdisciplinary environments.	Quantum Technologies and Quantum Engineering; Fundamentals of Nanotechnologies;
mastered the current state of the art of their subject area.	LO7. Investigate theoretical aspects of applied physics for scientific and pedagogical activities.	Applied Optoelectronics and Photonics; Semiconductor Structures; Sustainable Development Strategies.

Research, analysis, problem solving and evaluation Graduates		
are able to conduct independent scientific work,	LO3. Organise technological processes using modern methods of analysis.	Intellectual Property and Research; Information Technologies in Science and Production;
possess the ability to independently identify and analyse complex problems,	LO4. Systematise professional development in engineering, industrial production and scientific research.	Numerical Methods for Solving Physical Problems; Electron and Sonde Microscopy for Studying Nanomaterials;
are able to determine independently and using suitable methods the state of the art related to a certain problem, to clearly define an objective and to create a solution matrix,	LO5. Plan innovative engineering projects using modern diagnostic methods and resource management.	Spectral Methods for Studying Low-dimensional Objects;
can independently develop a solution for a proposal or test a hypothesis, present and discuss results, come to conclusions and summarise them in an understandable way,	LO8. Conduct independent scientific research in low-dimensional structures and applied physics.	Practical Perspective of X-ray Diffractometry; Research Practice; Research Work of Master's Student; Master's Thesis; Project Management.

are able to expand their knowledge and skills independently and methodically,	**LO4.** Systematize further education in the field of industrial production, technological engineering, scientific and innovative activities. **LO8.** Formulate system knowledge for independent research work on the creation, investigation and application of low-dimensional structures in applied physics.	History and Philosophy of Science; Intellectual Property and Research; Information Technologies in Science and Production; Sustainable Development Strategies; Research Practice; Research Work of Master's Student; Master's Thesis.
are able to critically reflect, discuss and evaluate research concepts and results,	**LO2.** Integrate scientific and professional knowledge and international experience into education, production, design, research and management. **LO6.** Formulate professional knowledge, demonstrate understanding and solve problems in new and interdisciplinary environments. **LO8.** Formulate system knowledge for independent research on the creation, investigation and application of low-dimensional structures in applied physics.	History and Philosophy of Science; Intellectual Property and Research; Information Technologies in Science and Production; Electron and Sonde Microscopy for Studying Nanomaterials; Spectral Methods for Studying Low-dimensional Objects; Research Practice; Research Work of Master's Student; Master's Thesis.

are in a position to use innovative methods to solve technological problems and to develop new methods where necessary,	**LO3.** Organise the work of teams on adjustment of technologically complex equipment using advanced methods and analytical tools. **LO5.** Plan and implement innovative projects using principles of production management and integrated resource diagnostics. **LO8.** Conduct independent research on the creation, investigation and application of low-dimensional structures in applied physics.	Information Technologies in Science and Production; Materials Science and Advanced Materials Technology; Synthesis Methods of Nanomaterials and Nanostructures; Quantum Technologies and Quantum Engineering; Numerical Methods for Solving Physical Problems; Electron and Sonde Microscopy for Studying Nanomaterials; Spectral Methods for Studying Low-dimensional Objects; Project Management; Research Practice; Research Work of Master's Student; Master's Thesis.

are able to formulate and to solve problems in new or emerging areas within their field of specialization,	**LO5.** Plan activities for the development of innovative projects using modern engineering methods and integrated resource management. **LO6.** Formulate professional knowledge, understanding and problem-solving skills in new and broader interdisciplinary environments. **LO8.** Conduct independent research on the creation, investigation and application of low-dimensional structures in the field of applied physics.	Materials Science and Advanced Materials Technology; Synthesis Methods of Nanomaterials and Nanostructures; Quantum Technologies and Quantum Engineering; Fundamentals of Nanotechnologies; Application of Quantum-size Structures in Micro- and Nanoelectronics Devices; Materials for Energy Storage and Conversion; Numerical Methods for Solving Physical Problems; Project Management; Research Practice; Research Work of Master's Student; Master's Thesis.

are able to solve scientific and technical problems in accordance with their level of knowledge and understanding and in collaboration with representatives of other disciplines,	**LO2.** Integrate scientific and professional knowledge and international experience into education, production, design, research and management. **LO3.** Organise the work of teams involved in adjustment of technologically complex equipment using modern analytical methods. **LO5.** Plan innovative engineering projects using modern production management principles and integrated resource diagnostics. **LO6.** Formulate professional knowledge, demonstrate understanding and solve engineering problems in new and interdisciplinary environments.	Information Technologies in Science and Production; Materials Science and Advanced Materials Technology; Thermodynamics; Solid State Physics and Crystallography; Project Management; Sustainable Development Strategies; Quantum Technologies and Quantum Engineering; Electron and Sonde Microscopy for Studying Nanomaterials; Research Practice; Research Work of Master's Student; Master's Thesis.

can use their creativity to develop new and original ideas,	**LO5.** Plan and develop innovative engineering projects using modern production management principles and integrated resource diagnostics. **LO6.** Formulate professional knowledge and develop original solutions for engineering problems in new and interdisciplinary environments. **LO8.** Conduct independent research on the creation, investigation and application of low-dimensional structures in applied physics.	Materials Science and Advanced Materials Technology; Synthesis Methods of Nanomaterials and Nanostructures; Quantum Technologies and Quantum Engineering; Materials for Energy Storage and Conversion; Production, Properties and Application of Carbon Low-dimensional Materials; Project Management; Numerical Methods for Solving Physical Problems; Research Practice; Research Work of Master's Student; Master's Thesis.

are able to further develop their skills and competences during their professional career and to make use of them accordingly.	**LO4.** Systematize further education in the field of industrial production, technological engineering, scientific and innovative activities. **LO6.** Formulate professional knowledge, understanding and problem-solving abilities in new and broader interdisciplinary environments. **LO8.** Develop system knowledge for independent research in the creation, investigation and application of low-dimensional structures in applied physics.	Materials Science and Advanced Materials Technology; Synthesis Methods of Nanomaterials and Nanostructures; Quantum Technologies and Quantum Engineering; Materials for Energy Storage and Conversion; Production, Properties and Application of Carbon Low-dimensional Materials; Project Management; Numerical Methods for Solving Physical Problems; Research Practice; Research Work of Master's Student; Master's Thesis.
Application Graduates		

are able to combine theory and practice in order to solve scientific and/or technological problems,	**O2.** Integrate scientific and professional knowledge and international experience into education, production, design, research and management. **LO3.** Organise the work of teams involved in adjustment of technologically complex equipment using modern analytical methods. **LO6.** Formulate professional knowledge and solve scientific and engineering problems in interdisciplinary environments. **LO8.** Conduct independent research on the creation, investigation and application of low-dimensional structures in applied physics.	History and Philosophy of Science; Psychology of Management; Higher School Pedagogy; Sustainable Development Strategies; Intellectual Property and Research; Project Management; Research Practice.
are able to combine knowledge and learning from various areas and to cope with complex issues,	**LO2.** Integrate scientific and professional knowledge and international experience into education, production, design, research and management. **LO3.** Organise the work of teams involved in adjustment of technologically complex equipment using modern analytical methods. **LO6.** Formulate professional knowledge and solve scientific and engineering problems in interdisciplinary environments. **LO8.** Conduct independent research on the creation, investigation and application of low-dimensional structures in applied physics.	Materials Science and Advanced Materials Technology; Synthesis Methods of Nanomaterials and Nanostructures; Application of Quantum-size Structures in Micro- and Nanoelectronics Devices; Semiconductor Structures; Electron and Sonde Microscopy for Studying Nanomaterials; Spectral Methods for Studying Low-dimensional Objects; Practical Perspective of X-ray Diffractometry; Numerical Methods for Solving Physical Problems.

have comprehensive knowledge of applicable technologies and methods and their limitations,	**LO3.** Organise the work of teams using appropriate methods and analytical tools. **LO5.** Plan innovative projects using engineering methods and integrated resource management. **LO8.** Conduct independent scientific research on the creation, investigation and application of low-dimensional structures in applied physics.	Thermodynamics; Solid State Physics and Crystallography; Materials Science and Advanced Materials Technology; Physical and Chemical Bases of Materials; Information Technologies in Science and Production; Quantum Technologies and Quantum Engineering; Numerical Methods for Solving Physical Problems; Project Management; Research Practice; Master's Thesis.
know the non-technological implications of the work of engineers and scientists, particularly the safety, social and ethical consequences as well as the general social context of their activities.	LO1. Assess commercialization opportunities and develop enterprise strategies in engineering physics, computer simulation and green energy considering sustainable development principles. LO2. Integrate scientific and professional knowledge and international experience into education, production, research and engineering practice. LO5. Plan innovative projects using engineering management principles and integrated resource management.	History and Philosophy of Science; Higher School Pedagogy; Psychology of Management; Sustainable Development Strategies; Intellectual Property and Research; Project Management; Research Practice.
General and social competences Graduates		

meet all the requirements that are placed on graduates of a master's degree regarding key qualifications,	O2. Integrate scientific and professional knowledge and international experience into education, production, design, research and management. LO4. Systematize further education in industrial production, technological engineering, scientific and innovative activities. LO6. Formulate professional knowledge, demonstrate understanding and solve problems in new and broader interdisciplinary environments. LO7. Explore the theoretical aspects of applied physics to improve scientific and pedagogical competencies.	Foreign Language (Professional); History and Philosophy of Science; Higher School Pedagogy; Psychology of Management; Intellectual Property and Research; Information Technologies in Science and Production; Project Management; Sustainable Development Strategies; Pedagogical Practice; Research Practice; Research Work of Master's Student; Master's Thesis.
are able to lead a cooperative and well-connected team,	LO3. Organise the work of teams involved in the adjustment of technologically complex equipment using appropriate analytical methods and tools. LO5. Plan and manage innovative engineering projects using modern production management principles and integrated resource management. LO6. Formulate professional knowledge and solve engineering problems in interdisciplinary environments.	Project Management; Psychology of Management; Higher School Pedagogy; Information Technologies in Science and Production; Sustainable Development Strategies; Research Practice; Research Work of Master's Student; Master's Thesis.
are able to effectively work and communicate in a national and international context,		

are in a position to recognise and evaluate the social, ethical, ecological and economic preconditions and implications of their projects,	LO2. Integrate scientific and professional knowledge and international experience into education, production, research, design and management. LO6. Formulate professional knowledge, demonstrate understanding and solve problems in new and broader interdisciplinary environments. LO7. Explore the theoretical aspects of applied physics to improve scientific and pedagogical competencies.	Foreign Language (Professional); History and Philosophy of Science; Higher School Pedagogy; Psychology of Management; Project Management; Sustainable Development Strategies; Research Practice; Research Work of Master's Student; Master's Thesis.
are in a position to evaluate their projects regarding occupational safety and work conditions and take adequate precautions to prevent accidents,	**LO3.** Organise the work of teams involved in the adjustment of technologically complex equipment using appropriate analytical methods and tools. **LO5.** Plan innovative engineering projects using modern production management principles and integrated resource management. **LO6.** Formulate professional knowledge and solve engineering problems in interdisciplinary environments, considering engineering standards and professional responsibility.	Project Management; Sustainable Development Strategies; Psychology of Management; Information Technologies in Science and Production; Materials Science and Advanced Materials Technology; Research Practice; Research Work of Master's Student; Master's Thesis.

are able to situate their professional activities within a broader societal context and to take on current social challenges.	**LO1.** Assess commercialization opportunities and develop enterprise strategies in engineering physics, computer simulation and green energy considering sustainable development. **LO2.** Integrate scientific and professional knowledge and international experience into education, research, production and engineering practice. **LO5.** Plan innovative engineering projects considering technological, environmental and societal needs.	Sustainable Development Strategies; History and Philosophy of Science; Psychology of Management; Higher School Pedagogy; Project Management; Intellectual Property and Research; Research Practice; Master's Research Work; Master's Thesis.