

APPROVED BY

Director of the School of Nuclear Science and Engineering
_____/ Oleg Yu. Dolmatov

**Specific Part, On-the Job Training
Pre-Graduation Practical Training**

Field of Study: Physics

Programme name: Condensed Matter Physics

Level of Study: Master Degree Programme

Year of admission: 2024

Semester, year: spring, 2026

ECTS: 18

Total Hours: 648

Contact Hours: 0

- **Lectures:** 0
- **Labs:** 0
- **Practical experience:** 0

Self-study: 648

Assessment: differential credit test

Department: Division for Experimental Physics

Head of Department _____ / Andey M. Lider

Instructor(s) _____ / Andey M. Lider

_____ / Roman S. Laptev

Pre-Graduation Practical Training

Practical Training

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| Practical Training Objectives | <p>The course is aimed at training specialists able to independently set specific tasks of scientific research in condensed matter physics and solve them with the help of modern equipment and information technologies using the latest domestic and foreign experience; to be fluent in physics sections necessary for solving problems in the professional field and apply the results of scientific research in project activities; to plan and conduct fundamental research on projects in the field of nuclear-physical research, interaction of radiation with matter, modernization of modern and creation of new methods of studying mechanical, electrical, magnetic, thermal properties of solids; to process, analyze and summarize scientific and technical information, advanced domestic and foreign experience in professional activity, make presentations of scientific research.</p> <p>The course goals are in compliance with the goals of master degree program within 03.04.02 Physics.</p> |
| Learning Outcomes | <p>Upon the course completion, students will be able to:</p> <ul style="list-style-type: none"> (a) set up research problems in physics and solve them with the help of modern equipment and information technology; (b) perform actions on compilation and design of scientific and technical documentation, scientific reports and dissertations; (c) apply the basic techniques of planning and carrying out fundamental research in condensed state physics and materials science; (d) processing, analysis and generalization of scientific and technical information, advanced domestic and foreign experience in professional activity for effective presentation of the results of scientific activity. |
| Practical Training Structure | <p>The practical training “Pre-Graduation Practical Training” includes independent study in multiple stages:</p> <p>Section (module) 1. Preparation stage:</p> <ul style="list-style-type: none"> - obtaining an individual task for the practice; - general briefing at the department (conducted by the head of the department or his/her deputy for practice): purpose and tasks of practice, procedure of practice, safety on the way to the place of practice; forms of communication with the department are indicated; - interview with the practice supervisor; - receive and processing of documents: referral, prescription and security clearance certificate, medical certificate on necessary vaccinations, contract documents (as required); - obtaining a diary and the rules of drawing up a practice report. |

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| | <p>Section (module) 2. Main stage:</p> <ul style="list-style-type: none"> - upon arrival at the practice place, after arranging accommodation and employment, informing (by letter, telephone, etc.) the TPU supervisors about their employment and, if any, about any difficulties and misunderstandings that may arise in the future during the practice course; - working with a supervisor from the enterprise (organisation), with whom the workplace, programme, individual assignment and procedure of the practice are specified; - the stage of collecting, processing and analysing the obtained information; - work at an enterprise in the field of specialty (the main period of practice); - practice diary management. <p>Section (module) 3. Research and/or development work:</p> <ul style="list-style-type: none"> - fulfilment of the planned scope of research and work within the framework of the assigned subject matter; - processing the available data and analysing the validity of the results obtained; - uncertainty calculation; - practice diary management. <p>Section (module) 4. Concluding stage:</p> <ul style="list-style-type: none"> - preparation of the report and practice diary, submitting it in a bound form for checking to the supervisor from the enterprise (organisation), who on the cover page makes a mark on a five-point system and certifies his signature with a seal; - turning in material assets, literature taken, settlement and dismissal (if any). |
| <p>Facilities and Equipment</p> | <p>Practical classes are held in computer-aided classrooms equipped with computer-aided teaching technologies for group work with the appropriate licensed software and access to the Internet for students to process and represent experimental results graphically.</p> <p>To ensure efficient independent study and access to electronic publications each student is provided with a workplace in a computer-aided classroom with access to the Internet within the scope of the subjects studied.</p> <p>For carrying out laboratory classes at the Division of Experimental Physics of the School of Nuclear Science and Engineering, the following state-of-the-art equipment is available: Shimadzu XRD-7000S X-ray diffractometer with vertical high-precision goniometer; laboratory unit for beam processing and magnetron sputtering; Raduga-Spectrum coating machine; hermetically sealed glove box SPEX GB 02M; METAM RV-21 microscope with DIC device; acoustic test bench; hydrogen generator model HyGen 200; DualTrans vacuum gauge; oscilloscope OSU-20; Claind NG 2301 nitrogen generator; vacuum pump NVR; diffusion pump NVD-400; vacuum station DRYTEL1025, MDP AMD4 configuration; hydrogen analyzer for metals and alloys RHEN602; Gas Reaction</p> |

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| | <p>Controller LP automatic system; controlled gas reactor for studying Gas sorption/desorption processes in metals and alloys at high temperatures. alloys at high temperatures; stationary gas analyser for hydrogen H₂ “Verba-SV”; Mass spectrometer MX 7304; Laboratory scales VLTE-150g with calibration weight 100 F1; Anest Iwata ISP-500C oil-free scroll forevacuum pump; analytical module for the study of optical spectra of materials in atomic hydrogen and plasma.</p> |
| <p>Grading Policy</p> | <p>Evaluation of the quality of learning performance and achievements for the discipline (module) during formative and summative assessment is performed in compliance with “TPU Regulations for Formative and Summative Assessment” (rector’s order # 59/оД dated as 25.07.2018).</p> <p>Intermediate certification on practice in the form of differentiated credit is carried out in the form of defense of the practice report.</p> <p>The maximum mark for one discipline (module) for one semester is 100 points including:</p> <ul style="list-style-type: none"> – mastering the discipline content (exam type – pass/fail exam; graded credit test); evaluated in formative assessment and summative assessment (interim attestation) is 100 points; – mastering the discipline content (exam type – exam); evaluated in formative assessment is 80 points and summative assessment (interim attestation) is 20 points; <p>The maximum mark for the course final project (course final paper) for one semester (depending on what is applicable in compliance with curriculum) is 100 points including:</p> <ul style="list-style-type: none"> – marks for formative assessment is 40 points, – marks for summative assessment (interim attestation, defense) is 60 points. <p>Assessment measures for formative assessment designed for discipline (module) corresponding to learning performance and achievements are stated in the Attachment “Calendar Plan and Assessment Measures for the Course”.</p> |
| <p>Practical Training Policy</p> | <p>To be allowed to take the final test, a student must attend a minimum of 80% of classroom activities and submit reports for all practical sessions.</p> <p>Evaluation of the quality of learning performance and achievements for the discipline (module) during formative and summative assessment is performed in compliance with “TPU Regulations for Formative and Summative Assessment” (rector’s order # 59/оД dated as 25.07.2018).</p> <p>The maximum mark for one discipline (module) for one semester is 100 points including:</p> <ul style="list-style-type: none"> – mastering the discipline content (exam type – pass/fail exam; graded credit test); evaluated in formative assessment and |

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| | <p>summative assessment (interim attestation) is 100 points;</p> <ul style="list-style-type: none"> – mastering the discipline content (exam type – exam); evaluated in formative assessment is 80 points and summative assessment (interim attestation) is 20 points; <p>The maximum mark for the course final project (course final paper) for one semester (depending on what is applicable in compliance with curriculum) is 100 points including:</p> <ul style="list-style-type: none"> – marks for formative assessment is 40 points, – marks for summative assessment (interim attestation, defense) is 60 points. <p>Assessment measures for formative assessment designed for discipline (module) corresponding to learning performance and achievements are stated in the Attachment “Calendar Plan and Assessment Measures for the Course”.</p> |
| <p>Teaching Aids and Recourses</p> | <p>Compulsory Readings:</p> <p>[1] Pasko, O. A. (2017) <i>Recommended as an educational and methodological manual by the Editorial and Publishing Council of Tomsk Polytechnic University</i>. Engineering and Technical Sciences. Access Scheme: https://e.lanbook.com/book/106748 (content)</p> <p>[2] Belyaev, V. I. (2012) <i>Master's thesis: methods and organisation of research, design and defence: textbook for Master's students</i>. Moscow: Knorus.</p> <p>[3] Armitage, A., Keeble-Allen, D. (2008). <i>Undertaking a structured literature review or structuring a literature review: Tales from the field</i>. Regent's College, London.</p> <p>[4] Herr, K., & Anderson, G. L. (2014). <i>The action research dissertation: A guide for students and faculty</i>. Sage publications.</p> <p>Further Readings:</p> <p>Wisker, G. (2017). <i>The postgraduate research handbook: Succeed with your MA, MPhil, EdD and PhD</i>. Bloomsbury Publishing.</p> <p>https://www.sciencedirect.com/</p> <p>https://www.springer.com/gp</p> |
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