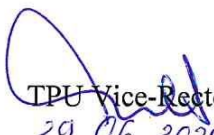


APPROVED BY


TPU Vice-Rector for Academic Affairs
29.06.2020 / Mikhail A. Solovyov

Programme Name: Nuclear Science and Technology

Degree: Master of Science

Field of Study: Nuclear Physics and Technology

Specialization: Nuclear medicine

Mode of Study: Full-time

Language of Instruction: English

Director

of School of Nuclear Science & Engineering

Head of Nuclear Fuel Cycle Division

Program Director







/ Oleg Yu. Dolmatov

/ Alexey G. Goryunov

/ Vera V. Verkhoturova

Programme Name: Nuclear Science and Technology

Programme Description

Degree awarded	Master of Science in Nuclear Physics and Technology
Specialization	Nuclear medicine
Mode of Study	Full-Time
Language of Instruction	English
Programme Duration	2 years (120 ECTS)
Entry Requirements	<p>Academic Entry Requirements: Bachelor Degree or equivalent degree and qualification.</p> <p>English Language Requirements: English as a native language / IELTS (5.5 or better) or Equivalent Certificate / TPU Entrance Test</p> <p>Selection process: All individuals are selected on their results of TPU Entrance Exams. Additional selection criteria: GPA in Bachelor Programme; relative merits and abilities of the applicant, approved by certificates.</p>
Fees and Funding	General TPU policies are applied. Please see regulations applied to this programme or make an enquiry to the department.
How to Apply	<p>Application via on-line application system is possible, please follow the link: https://abiturient.tpu.ru/interstudent/app-form.html or by email: omrs@tpu.ru.</p> <p>For more details, please go to: https://abiturient.tpu.ru/interstudent/contacts.html</p>

Programme webpage: <https://abiturient.tpu.ru/direction?type=magistracy>

Introducing Your Degree

National Research Tomsk Polytechnic University (hereinafter referred to as TPU) has been providing for training specialists in a range of nuclear fields, including nuclear power engineering, medical physics and nuclear medicine, and a lot others, for more than 65 years.

One of the remarkable features of the program is TPU being one of the ROSATOM core universities, which provides its both Russian-speaking and international students with a unique opportunity to conduct research at the premises of its own only-in-Russia university research and training reactor.

Another important characteristic of the programme is that admitted students have an opportunity to complete industrial internship at the premises of State Atomic Energy Corporation Rosatom enterprises, which enables graduates to apply the obtained knowledge and skills in practice.

TPU has long-term experience in the development and production of medical radiopharmaceuticals using the basic facilities of the TPU, such as the IRT-T research reactor and the R-7M cyclotron. The program divided into three terms covers basic physics of nuclear medicine and medical sciences, radiation safety, radiation therapy and imaging, and producing and application of radiopharmaceuticals.

Programme Overview

Nuclear medicine is a unique networked programme, which began in 2015 after the signing of the agreement between TPU and Siberian State Medical University (Tomsk, Russia). The first graduation of specialists took place in 2017.

One of the key features of the program is that the educational process, including lectures, practical and laboratory classes, is implemented exclusively in English.

Another important characteristic of the target program is that professional training of highly qualified specialists in medical physics is conducted in close cooperation between the teaching staff of TPU, Siberian State Medical University and a wide range of specialists from the Tomsk Regional Oncology Center.

The research component of the training programme is realized using unique scientific research nuclear facilities, including the current IRT-T TPU research nuclear reactor, R-7M TPU research cyclotron, intraoperative radiation therapy equipment based on TPU betatrons, etc.

A special role in the implementation of practical and research training of students enrolled in Nuclear Medicine belongs to the Tomsk Regional Oncology Center, which serves as a unique platform for students to carry out research projects, conduct internships and prepare graduation thesis under the guidance of highly qualified specialists from the Tomsk Regional Oncology Center. The research topics generally involve:

- Development of technologies of nuclear doping of silicon and the production of isotopes for medical purposes.
- Investigations of the influence of various phenomena on metabolic processes.
- Investigation of the properties of track membranes in various ways.
- Study of biocomposite materials.
- Use of plasma processing materials.
- Development of medical devices and sensors.
- Study of planning radiation therapy methods.
- Calculation of radiation-hazardous objects protection.
- Investigation of the dynamics of the fields of ionizing radiation;
- Investigation of methods for determining radiation and environmental contamination of territories.
- and others.

By the end of the study, graduates are expected to:

- apply deep mathematical, scientific, socio-economic and professional knowledge in theoretical and experimental research in the field of medical physics and nuclear medicine;
- assign and solve innovative engineering and physical tasks, implement projects in the field of medical physics and nuclear medicine;
- create theoretical, physical and mathematical models describing the distribution and interaction of ionizing radiation with matter and living tissue, processes in accelerators, processes and mechanisms of radioactivity transfer in the environment and living tissue;
- develop new algorithms and methods for designing modern physical medical installations and devices, measurement of the characteristics of the ionizing radiation fields, research in medical physics and nuclear medicine;
- assess the prospects for the development of nuclear medicine, analyze radiation risks and scenarios of potential accidents, develop measures to reduce risks and ensure radiation safety, guided by laws and regulations, draw out an expert report.

Learning Outcomes

Universal competences

1. Ability to make critical analysis of problem-based situations based on the systems analysis approach, generate decisions and action plans.
2. Ability to run a project at all life-cycle stages.
3. Ability to organize and lead the teamwork and generate a team strategy to achieve the target goal.
4. Ability to use modern communication technologies to realize academic and professional interaction.
5. Ability to analyze and account for cultural diversity in the process of intercultural interaction.
6. Ability to set and pursue individual and professional activity priorities and ways to modify professional activity based on the self-esteem.

General professional competences

1. Ability to formulate goals and objectives of the research study, select assessment criteria, identify priorities for solving problems
2. Ability to apply modern research methods, evaluate and present the results of the performed research.
3. Ability to present research outcomes in the form of articles, reports, scientific reports and presentations using computer layout systems and office software packages.

Professional competences

1. Ability to maintain medical and technical documentation related to the medico-physical aspects of radiation therapy, interventional radiology and radionuclide diagnostics and therapy.
2. Ability to ensure radiation safety of personnel, the public and the environment, to carry out radiation monitoring of the exposure levels of patients, personnel, the public and the environment
3. Ability to operate and maintain equipment and tools applied for the medical use of radiation.
4. Ability to manage the quality of physical and technical aspects within radiation therapy, diagnostics, interventional radiology and radionuclide diagnostics and therapy departments in accordance with the equipment, regulatory requirements and staffing of a medical organization.
5. Ability to conduct and organize dosimetry planning, clinical dosimetry, quality assurance procedures for radiotherapy, interventional radiology, and radionuclide diagnostics and therapy.
6. Ability to apply knowledge of natural sciences, fundamental laws in the field of nuclear physics and technology, clinical and radiation standards, hygienic measures in nuclear medicine, which is sufficient to undertake studies of issues associated with medical physics using modern equipment and information technologies relying on the latest Russian and international experience.
7. Ability to develop reference books, tables and software containing data for clinical use in dosimetric planning of radiation therapy, radionuclide diagnostics and therapy.
8. Ability to take part in the design and physical and technical equipment development for radiation therapy, diagnostics, interventional radiology and radionuclide diagnostics and therapy, radiation safety divisions.
9. Ability to conduct training sessions and develop instructional materials for the training courses within the cycle of professional training programs (bachelor's degree).

Core training courses

1. Radiation physics
2. Anatomy and physiology. Basics of roentgenology
3. Radiobiological Basics of Radiotherapy
4. Modern medical imaging technologies
5. Ionizing radiation installations
6. Clinical dosimetry
7. Mathematical Methods for imaging in medicine and medical statistics
8. Treatment planning
9. Radiochemistry. Clinical application of radioisotopic and roentgen diagnostics
10. Radiochemistry. Application of radionuclides and radiopharmaceuticals in diagnostics and therapy

Degree Requirements

To be awarded to Master Degree, a student should successfully complete all programme courses and modules and defend his/her Master thesis.

Description of a course including assessment methods and tools is given in the training course program.

Facilities and Equipment

1. TPU's nuclear research reactor IRT-T.
2. Laboratories located at the IRT-T TPU: clean rooms complex to produce radiopharmaceuticals, technological complex to produce radiopharmaceuticals based on Tc-99M, technological complex for neutron-capture therapy.
3. TPU's cyclotron complex for radiopharmaceuticals production (E=12MeV).
4. TPU's cyclotron RM7 (E=12 MeV).
5. TPU's modern spectroscopic complexes (Canberra Ind.).
6. TPU's labs for radiation sources research and nuclear and radioactive materials analysis.
7. Diagnostic complex of clinics of the Siberian State Medical University: X-ray machine Apollo DRF Villa Sistemi Medicali, CT General Electric Optima CT660, MRI General Electric Signa Creator 1.5T; SPECT Philips BrightView, ultrasonic devices Toshiba Aplio 400, 500, negatoscopes; complex computer multifunctional for the study of EEG and EMG; ergographic complex for assessing regional blood flow REO spectrum, pressotachospirograph PTS-14P, portable spirograph SMP-21/01, electrocardiograph EKTTS-3 / 6-04 Axion, computer electrocardiograph Polyspectrum 8, portable electrocardiograph Heart Mirror 3IKO, electrocardiograph EK12T-01-R-D, ЭК electrocardiograph EK ZT-01- "3-D", dummy for an ECG (specialized simulator).

Academic Exchanges

A part of the Program can be studied at TPU partner university. Please see all possibilities and regulations at www.ciap.tpu.ru

Career Opportunities:

Career fields and types of organizations:

- Research institutes.
- Medical centers, institutions and clinical divisions.

- Medical laboratories.
- Universities or any other educational institutions.

Positions:

- Researcher and medical physicist in the field of radiation therapy planning.
- Researcher and medical physicist in the field of clinical dosimetry.
- Radiological / radiation safety specialist.
- Researcher and medical physicist in the field of medical imaging.
- Teaching position in the field of medical physics.

Internships:

- Enterprises of State Atomic Energy Corporation Rosatom.
- Tomsk regional oncology center.
- Tomsk oncology research institute.
- Tomsk cardiology research institute.
- TPU's nuclear research reactor IRT-T, cyclotron complex and laboratories.

Further Studies:

Graduates can apply to the TPU's PhD program in the field "Nuclear, Thermal and Renewable Energy and Associated Technologies", which is implemented in English.

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Key Facts and Recognition

The master degree programme “Nuclear medicine” was launched in 2016 in close collaboration with the Siberian State Medical University. There have been five admissions to the target program since 2016. Graduates of the program represent such countries as Egypt, Tanzania, Ghana, Zambia, South Africa and others.

The remarkable feature of the program is that the team of researches involved in the implementation of the training of medical physicists became the winners in the completion of Tomsk Oblast in the field of education, science, medicine and culture in 2020.