TOMSK POLYTECHNIC UNIVERSITY ТОМСКИЙ ПОЛИТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

APPROVED BY

Director of Nuclear Science & Engineering School
_____ / Oleg Yu. Dolmatov
"25" 06 2020

Course Name: Non-Proliferation of Nuclear Materials

Field of Study: Nuclear Science and Technology

Programme name: Nuclear Science and Technology

Specialization: Nuclear Safety, Security and Non-Proliferation of Nuclear Materials

Level of Study: Master Degree Programme

Year of admission: 2020

Semester, year: semester 1, year 1

ECTS: 3

Total Hours: 108

Contact Hours: 48

- **Lectures:** 16
- **Practical experience:** 16
- **Labs:** 16

Self-study: 60

Assessment: credit-test

Division: Nuclear Fuel Cycle

Director of Programme _____ / Vera V. Verkhoturova

Instructor _____ / Maxim E. Silaev

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Course name: Non-Proliferation of Nuclear Materials

Course Overview

Course Objectives	The objective of the training course is to develop students' theoretical knowledge and practical skills, which are necessary to conduct professional activity involving the usage of requirements of internationally accepted non-proliferation regime for nuclear materials and activities.
Learning Outcomes	**Upon completion of the course, a graduate will obtain the knowledge of:** – strategy performance methods for identification and solving problem situations; – principals of a report structuring and presentation preparation in a foreign language (English), adopted in the international environment; – international and national regulation in the field of non-proliferation. **Upon completion of the course, graduates are expected to develop the following skills:** – to develop a strategy of performance and undertake specific decisions for strategy implementation; – to compile and present technical and scientific information used in professional activities in the form of a presentation; – to identify and use the most significant aspects of legislative regulation for the analysis of technical information and maintaining of the non-proliferation regime. **Upon completion of the course, graduates should acquire the practical experience in:** – using goal adjustment and achievement methodologies, development of performance technologies; – using speaking skills in a foreign language in accordance with the field of training; – application of a foreign language at a sufficient level for professional activities in future; – selection and analysis of information in international and national regulation of nuclear safety and radiation protection.
Course Outline	The training course is delivered through the following teaching modes: – 8 lectures; – 8 practical experiences; – 4 labs. The course consists of 2 sections, which are given below. **Section 1. Technical background of non-proliferation regime.** **Section 2. Non-proliferation, safeguard and security regime.** Each section includes several lectures, practical experiences and labs. The training course finishes with a credit-test (quiz). The course implies conducting 2 intermediate colloquiums and 4 lab defenses. Each colloquium is scored with the maximum of 20 points. Totally, students can obtain 40 points for the participation and good performance in colloquiums. Defense of 4 labs is evaluated with maximum of 40 points.
Course Structure	The content of the course covers 2 topics. Each topic is studied through lectures, practical experiences and labs.

	Section 1. Technical background of non-proliferation regime. Nuclear and radioactive materials are a source of danger. The danger level allows their effective use for military and terrorist purposes. The level of potential detrimental consequences largely depends on the properties of the materials used. Nuclear materials and radiation sources suitable for their use in order to cause harm to people and the environment must have specific properties. The list of facilities and materials with hazardous properties, technologies for their production and use are defined and are subject to control for the non-proliferation of weapons of mass destruction (WMD). **Section 2. Non-proliferation, safeguard and security regime.** In order to limit the possibility for using nuclear and radioactive materials for military and terrorist purposes, the international community has created a non-proliferation regime for weapons of mass destruction. The basis of the non-proliferation regime is international multilateral and bilateral treaties (the Treaty on the Non-Proliferation of Nuclear Weapons, the Comprehensive Test Ban Treaty, etc.). International controls over the implementation of treaty obligations in the field of non-proliferation (for states that do not officially possess nuclear weapons) belong to IAEA. One of the main control tools is the internationally accepted safeguard system. In addition to the safeguards, there is a nuclear security system relying on which states realize physical protection from malicious use of nuclear and radiation materials and technologies.
Facilities and Equipment	1. Lecture Hall with multimedia equipment: 634050, Tomsk, Lenin ave., 2, building 10, room 340, room 248.
Grading Policy	In accordance with TPU rating system we use: – Current assessment which is performed on a regular basis during the semester by scoring the quality of mastering of theoretical material and the results of practical activities (performance tests, perform tasks, problem solving) and final assessment. – Max score for current and final assessment is 100 points, min – 55 points. The final rating is determined by summing the points of the current assessment during the semester and participation in the final grading activity (interview) at the end of the semester. Maximum overall rating corresponds to 100 points, min pass score is 55.
Course Policy	Attendance is strictly controlled. All classes are obligatory for attendance.
Teaching Aids and Resources	**Compulsory reading:** 1. Poneman, D. B. Nuclear Energy and Nonproliferation / D. B. Poneman. - Текст электронный // Atomic Energy. – 2011. - Vol. 110, № 4. – P. 217-220. - URL: https://link.springer.com/article/10.1007/s10512-011-9414-4 (дата обращения: 20.09.2020). – Режим доступа : по подписке. 2. Morse, E. C. Analytical Methods for Nonproliferation / E. C. Morse. — Cham : Springer International Publishing, 2016. — XIII, 250 p. — Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007%2F978-3-319-29731-6 (дата обращения: 20.09.2020). – Режим доступа : по подписке. 3. Analysis of questions concerning the nonproliferation of fissile materials for low-and medium-capacity nuclear power systems / V. V. Petrunin, V. I.

	Polunichev, Yu. P. Sukharev [and etc.]. - Текст электронный // Atomic Energy. – 2008. - Vol. 105, № 3. – P. 159-164. - URL: https://link.springer.com/article/10.1007/s10512-008-9081-2 (дата обращения: 20.09.2020). – Режим доступа : по подписке. **Additional reading:** 1. Технические аспекты ядерного нераспространения: учебное пособие / Э. Ф. Крючков, Н. И. Гераскин, В. Б. Глебов, В. М. Мурогов. — Москва : НИЯУ МИФИ, 2010. — 224 с. — ISBN 978-5-7262-1277-7. — Текст : электронный // Лань : электронно-библиотечная система. — URL: https://e.lanbook.com/book/75756 (дата обращения: 26.05.2020). — Режим доступа : для авториз. пользователей.
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