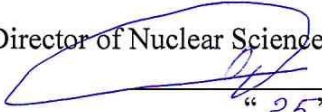


APPROVED BY

Director of Nuclear Science & Engineering School

 / Oleg Yu. Dolmatov

"25" 06 2020

Course Name: Import, Export and Transit of Nuclear and Other Radioactive 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 3, year 2

ECTS: 5

Total Hours: 180

Contact Hours: 64

- **Lectures:** 16
- **Practical experience:** 16
- **Labs:** 32

Self-study: 116

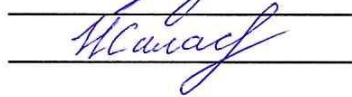
Assessment: Exam

Division: Nuclear Fuel Cycle

Director of Programme

 / Vera V. Verkhoturova

Instructor

 / Maxim E. Silaev

Course name: Import, Export and Transit of Nuclear and Other Radioactive 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 in the fields related to import, export and transit of nuclear and radioactive materials.
Learning Outcomes	<p>Upon completion of the course, a graduate will obtain the knowledge of:</p> <ul style="list-style-type: none"> – project development and implementation stages; – team building techniques; – principals of a report structuring and presentation preparation in a foreign language (English), adopted in international environments; – order and methods of preparation transboundary shipment of nuclear and radioactive materials; – technical features transboundary shipment of nuclear and radioactive materials; – international regulation in fields of nuclear and radioactive materials shipment; – requirements to transboundary casks for nuclear and radioactive materials. – safeguard and security requirements to export–import operations with nuclear and radioactive materials <p>Upon completion of the course, graduates are expected to develop the following skills:</p> <ul style="list-style-type: none"> – to explain objectives and develop tasks associated with the preparation and implementation of a project, to determine main stages and direction of activity; – to manage of a project at all stages of its life cycle; – to develop a plan of group and organizational communications during a process of a project preparation and implementation, to formulate personal tasks to team members for objectives achievement; – to compile and present technical and scientific information used in professional activities in the form of a presentation; – to make arrangements for nuclear and radioactive materials control and account during transboundary shipment operations; – to use informational technologies for arrangement and performance of export–import operations; – to prepare of documentation supporting of nuclear and radioactive materials shipment. <p>Upon completion of the course, graduates should acquire the practical experience in:</p> <ul style="list-style-type: none"> – using methods of assessment of resource requirements and project effectiveness; – analysis, design and organization of interpersonal communication in a team to achieve the set goal; – using speaking skills in a foreign language in accordance with the field of training. The performance of a speaker shall be justified and supported with auxiliary means (such as tables, graphs, charts, etc.); – application of a foreign language at a sufficient level for professional activities

	<p>in future;</p> <ul style="list-style-type: none"> – preparation of transboundary shipment of nuclear and radioactive materials; – computational assessment of devices for monitoring of nuclear and radioactive materials during performance of export-import operations with them; – categorization of nuclear and radioactive materials in accordance with international regulation for transportation.
Course Outline	<p>The training course is delivered through the following teaching modes:</p> <ul style="list-style-type: none"> – 8 lectures; – 8 practical experiences; – 8 labs. <p>The course consists of 2 sections, which are given below.</p> <p>Section 1. Safety of export-import operations with nuclear and radioactive materials.</p> <p>Section 2. Safeguard and Security of export-import operations with nuclear and radioactive materials.</p> <p>Each section includes several lectures, practical experiences and labs.</p> <p>The training course finishes with an exam.</p> <p>The course implies conducting of 2 intermediate colloquiums and 8 lab defenses. Each colloquium is scored with the maximum of 20 points. The 8 lab defenses are scored with the maximum of 40 points.</p>
Course Structure	<p>The content of the course covers 2 topics. Each topic is studied through lectures, practical experiences and labs.</p> <p>Section 1. Safety of export-import operations with nuclear and radioactive materials.</p> <p>The shipment of nuclear and radioactive materials between States is a complex business that requires coordination at the State level. The transboundary transportation of nuclear and radioactive materials requires to take into account both international and national regulations. Compliance with nuclear and radiation safety requirements are mandatory during performance of transboundary export-import operations and are subject to the interstate settlement. Export-import operations with nuclear and radioactive materials should be carried out using technical means and technologies that must to have a state certification in all interested states.</p> <p>Section 2. Safeguard and Security of export-import operations with nuclear and radioactive materials.</p> <p>The transboundary transportation of nuclear and radioactive materials has high risk even in comparison with domestic shipments. Interstate transportations, especially those carried out through the territories of transit states, require of maintaining a unified high interstate standard of control and security along the entire route of the cargo. Along the route, it is necessary to ensure not only the security of the cargo, but also a safety and security of the personnel, the population and the environment in accordance with the national regulations of all participating parties. A number of security issues require the involvement of special forces and technical means, as well as ensuring the required level of confidentiality.</p>
Facilities and Equipment	<p>1. Lecture Hall with multimedia equipment: Tomsk, Lenin ave., 2, building 10, room 340.</p>
Grading	<p>In accordance with TPU rating system we use:</p>

Policy	<ul style="list-style-type: none"> – 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). Max score for current assessment is 80 points, min – 44 points. – Course final assessment (exam/ credit test) is performed at the end of the semester. Max score for course final assessment is 20 points, min – 11 points. <p>The final rating is determined by summing the points of the current assessment during the semester and protection of the course project at the end of the semester. Maximum overall rating corresponds to 100 points, min pass score is 55.</p>
Course Policy	Attendance is strictly controlled. All classes are obligatory for attendance.
Teaching Aids and Resources	<p>Compulsory Reading:</p> <ol style="list-style-type: none"> 1. Domenech, H. Radiation Safety. Management and Programs / H. Domenech. - Cham : Springer, 2017. - 332 p. - Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-3-319-42671-6 (дата обращения: 20.09.2020). – Режим доступа : по подписке. 2. Numerical Modeling of the Thermal State of a Metal-Concrete Container with Spent Nuclear Fuel during Its Transportation / Yu. E. Karyakin, V. M. Kuzin, A. A. Pletnev, E. D. Fedorovich. – Текст электронный // Journal of Engineering Physics and Thermophysics. – 2018. - Vol. 91, № 4. – P. 991-998. - URL: https://link.springer.com/article/10.1007/s10891-018-1825-9 (дата обращения: 20.09.2020). – Режим доступа : по подписке. <p>Additional reading:</p> <ol style="list-style-type: none"> 3. Pham H. Safety and Risk Modeling and Its Applications / H. Pham. – London : Springer-Verlag Ltd., 2011. – 429 p. – Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-0-85729-470-8 (дата обращения: 20.09.2020). – Режим доступа: из корпоративной сети ТПУ. 4. Nuclear Energy. A Volume in Encyclopedia of Sustainability Science and Technology Series / by editor N. Tsoulfanidis. - second edition. - New York : Springer. 2018. – 438 p. - Текст: электронный // SpringerLink. – URL: https://link.springer.com/referencework/10.1007/978-1-4939-6618-9 (дата обращения: 20.09.2020). – Режим доступа : по подписке.
Instructor	Maxim E. Silaev, Associate professor, Nuclear Fuel Cycle Division, School of Nuclear Science and Engineering, Tomsk Polytechnic University, e-mail: silaev@tpu.ru, phone: +7 (3822) 701-777 ext. 5410