


APPROVED BY

Director of Nuclear Science & Engineering School

 / Oleg Yu. Dolmatov

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Course Name: International and National Regulation in Nuclear Safety

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:** 24
- **Practical experience:** 24

Self-study: 60

Assessment: Exam, graded credit-test

Division: Nuclear Fuel Cycle

Director of Programme

 / Vera V. Verkhoturova

Instructor

 / Maxim E. Silaev

Course name: International and National Regulation in Nuclear Safety

Course Overview

Course Objectives	<p>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 international and national regulation in nuclear safety.</p>
Learning Outcomes	<p>Upon completion of the course, a graduate will obtain the knowledge of:</p> <ul style="list-style-type: none"> – international and national regulation in fields of safety operation of nuclear and radiation facilities; – international and national regulation in the field of nuclear safety and radiation protection. <p>Upon completion of the course, graduates are expected to develop the following skills:</p> <ul style="list-style-type: none"> – to compile and present technical and scientific information used in professional activities in the form of a presentation; – to draw up a general plan of a report and presentation in foreign (English) language in accordance with internationally accepted principals; – to use a regulation for development of technical documentation for operation of nuclear and radiation facilities; – to find and use the most essential aspects of regulation for nuclear safety analysis performance. <p>Upon completion of the course, graduates should acquire the practical experience in:</p> <ul style="list-style-type: none"> – using speaking skills in a foreign language in accordance with the field of training. The position of speaker should be proved by reasons and supported by auxiliary means (such as tables, graphs, charts, etc.); – application of a foreign language at a sufficient level for professional activities in future; – using regulatory documents for safety operation of nuclear and radiation facilities; – selection and analysis of information in international and national regulation of nuclear safety and radiation protection.
Course Outline	<p>The training course is delivered through the following teaching modes:</p> <ul style="list-style-type: none"> – 12 lectures; – 12 practical experiences; – 1 term project. <p>The course consists of 2 sections, which are given below.</p> <p>Section 1. General requirements to safety systems, safety of radiation sources and radioactive wastes.</p> <p>Section 2. Safety requirements to nuclear reactors and nuclear fuel cycle facilities</p> <p>Each section includes several lectures and practical experiences.</p> <p>The training course finishes with an exam.</p> <p>The course implies conducting 2 intermediate colloquiums and a term project. Each colloquium is scored with the maximum of 20 points.</p>

	<p>In the course of study, students perform 2 tests, each of which includes 4 subtests. Each subtest is evaluated with 5 points. Total score for each of the tests is 20 points.</p> <p>The term project is evaluated with the maximum of 40 points for the content of the project and 60 points – for the defense of the project.</p> <p>The term project includes the following tasks:</p> <ol style="list-style-type: none"> 1. Development of a nuclear safety and radiation protection regulation at a national level. 2. Development of a radiation protection system for a center of irradiation. 3. Development of a nuclear safety and radiation protection system for a nuclear power plant. 4. Development of a nuclear safety and radiation protection system for a research nuclear reactor facility. 5. Development of nuclear safety and radiation protection system for a nuclear fuel cycle facility. 6. Development of a radiation protection system for a radioactive wastes repository facility.
Course Structure	<p>The content of the course covers 2 topics. Each topic is studied through lectures and practical experiences.</p> <p>Section 1. General requirements to safety systems, safety of radiation sources and radioactive wastes.</p> <p>Safety requirements at the international and national levels are hierarchical. The first element of the hierarchical structure is the requirements at the state/national level. The following are the requirements for a management system in the field of nuclear safety and radiation protection. The most generic are the requirements to radiation sources. The radiation sources include all type of radioactive objects under regulatory control (from isotopic sources to nuclear and radiation facilities). An inherent consequence of the use of radiation sources is the generation of radioactive waste (RW). Safe handling with RW its own requirements.</p> <p>Section 2. Safety requirements to nuclear reactors and nuclear fuel cycle facilities.</p> <p>Safety of nuclear facilities has additional requirements in comparison with radiation ones. Special requirements are due to the presence of a specific type of hazard for systems capable of neutron multiplication. Safety analysis for such facilities should take into account the possibility of criticality condition appearance in the neutron multiplication system. Special safety requirements are also applied to radioactive waste storage facilities. Peculiarities of the safety requirements for such enterprises are due to the long/unlimited nature of their use with the potential absence of human intervention to the storage process. The development of safety culture provides a continuous increase in the level of nuclear and radiation safety at facilities.</p>
Facilities and Equipment	<p>1. Lecture Hall with multimedia equipment: 634050, Tomsk, Lenin ave.,2, building 10, room 248, room 340.</p>
Grading Policy	<p>In accordance with TPU rating system we use:</p> <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

	<p>semester. Max score for course final assessment is 20 points, min – 11 points. 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	<p>Attendance is strictly controlled. All classes are obligatory for attendance.</p>
Teaching Aids and Resources	<p>Compulsory reading:</p> <ol style="list-style-type: none"> 1. Safety Cultures, Safety Models Taking Stock and Moving Forward / by editors C. Gilbert, B. Journé, H. Laroche; C. Bieder. - Cham : Springer Open, 2018. - Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-3-319-95129-4 (дата обращения: 20.09.2020). – Режим доступа : по подписке. 2. 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. 3. Prince, R. Radiation Protection at Light Water Reactors / R. Prince. - New York : Springer, 2012. – XIV, 366 p. - Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-3-642-28388-8 (дата обращения: 20.09.2020). – Режим доступа : по подписке. <p>Additional reading:</p> <ol style="list-style-type: none"> 1. Marguet S. The Physics of Nuclear Reactor / S. Marguet. – Cham : Springer International Publishing AG, 2017. – XXXII, 1445 p. – Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-3-319-59560-3 (дата обращения: 20.09.2020). – Режим доступа : по подписке.
Instructor	<p>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</p>