APPROVED BY

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

Course Name: Nuclear Cyber Security

Field of Study: Nuclear Science and Technology

Programme name: Nuclear Science and Technology

Academic profile: Nuclear Safety, Security and Non-Proliferation of Nuclear Materials

Level of Study: Master Degree Programme

Year of admission: 2020

Semester, year: semester 2, year 1

ECTS: 3

Total Hours: 108

Contact Hours: 32

- **Lectures:** 16
- **Labs:** 16

Self-study: 76

Assessment: Exam, graded credit-test

Division: Nuclear Fuel Cycle

Director of Programme _____ / Vera V. Verkhoturova
Instructor _____ / Alexey G. Goryunov

Course name: Nuclear Cyber Security

Course Overview

Course Objectives	The objective of the training course "Nuclear Cyber Security" is to develop basic knowledge in the major aspects of up-to-date techniques applied in the field of operational technology and information technology in industrial control systems, cyber risk in industrial control systems, nuclear cybersecurity challenges and threat modelling for NPPs.
Learning Outcomes	**Upon completion of the course, a graduate will obtain the knowledge of:** −main types, methods and technologies of security leakage, data detection, information capturing and cyber security at nuclear and radiation facilities; −term project lifetime phases; −basics of structuring a report and preparing presentations in a foreign language (English), accepted in an international scene; −requirements and regulatory basis for engineering development and support of cyber security; −hardware/software features and cyber security systems at nuclear fuel cycle facilities. **Upon completion of the course, graduates are expected to develop the following skills:** − to assess hardware and software quality; −to develop a project taking into account the analysis of alternative form for its implementation, determine target stages, main areas of work; −apply methods and modes of technical information protection; − to use the regulatory basis to cyber security systems. **Upon completion of the course, graduates should acquire the practical experience in:** − application of the acquired knowledge of a foreign language (English) at a sufficient level in their future professional activities; − using types, methods and technologies for calculation and monitoring measures of technical information protection; − development and project management methods; − development of technical information security provisions in information and industrial systems at nuclear fuel cycle facilities; − using the hardware/software features of nuclear fuel cycle facilities.
Course Outline	The training course is delivered through the following teaching modes: − 8 lectures; − 3 labs − term project. The course consists of 4 sections, which are given below. **Section 1. Introduction.** **Section 2. Information assessment methodology and process.** **Section 3. Threats, vulnerabilities and risk management.** **Section 4. Site security framework of a nuclear facility.** Each section includes lectures and some of it includes laboratory work. The course finishes with an exam and requires completion and defense of a term

	project. The course implies conducting 3 tests. Each test is scored with the maximum of 15 points. The term project includes the following tasks: 1. Determination of a cyber security objects. 2. Risks calculation. 3. Countermeasures implementation.
Course Structure	The content of the course covers 4 topics. Each topic is studied through lectures. **Section 1. Introduction.** Regulators, regulating agency and the foundations of the regulatory framework in the field of information security at nuclear fuel cycle facilities are considered. **Section 2. Information assessment methodology and process.** Procedures, processes and methodology for assessing cyber security at nuclear sites. Requirements for controlling access to resources and an overview of possible incidents are given. **Section 3. Threats, vulnerabilities and risk management.** Sources of risks, threats and vulnerabilities of information network system. The lifetime phases and operation of facilities and possible attack scenarios are presented. **Section 4. Site security framework of a nuclear facility.** The policy and plan for ensuring computer security, computer systems at nuclear facilities and methods of encoding transmitted information are considered.
Facilities and Equipment	1. Lecture Hall with multimedia equipment: 634050 Tomsk, Lenin ave. 2, building 10, room 313. 2. Computer classroom: 634050 Tomsk, Lenin ave. 2, building 10, room 319.
Grading Policy	In accordance with TPU rating system we use: − 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. 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.
Course Policy	Attendance is strictly controlled. All classes are obligatory for attendance.
Teaching Aids and Resources	**Compulsory reading:** 1. Critical Infrastructures, Key Resources, Key Assets. Risk, Vulnerability, Resilience, Fragility, and Perception Governance / Adrian V. Gheorghe, Dan V. Vamanu, Polinpapilinho F. Katina, Roland Pulfer. — Cham : Springer International Publishing, 2018. — 442 p. — Текст: электронный // SpringerLink. – URL: https://link.springer.com/chapter/10.1007/978-3-319-69224-1_1 (дата обращения: 20.09.2020). – Режим доступа : по подписке. 2. Cyber Security. Deterrence and IT Protection for Critical Infrastructures / by editor Maurizio Martellini. — Cham : Springer International Publishing, 2013. — VII, 72 p. — Текст: электронный // SpringerLink. – URL: https://link.springer.com/chapter/10.1007/978-3-319-02279-6_6 (дата обращения: 20.09.2020). – Режим доступа : по подписке. **Additional reading:** 1. 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.
Instructor	Alexey G. Goryunov, Head of Nuclear Fuel Cycle Division, School of Nuclear Science & Engineering, TPU, tel.: +7 (3822) 701-777 ext. 2331, email: alex1974@tpu.ru, personal site: https://portal.tpu.ru/SHARED/a/ALEX1479