TOMSK POLYTECHNIC UNIVERSITY ТОМСКИЙ ПОЛИТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

APPROVED BY

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

Course Name: Radiation safety in medical applications

Field of study: Nuclear Science and Technology

Programme name: Nuclear Science and Technology

Specialization: Nuclear medicine

Level of study: Master Degree Programme

Year of admission: 2020

Semester, year: semester 3, year 2

ECTS: 3

Total Hours: 108

Contact Hours: 32

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

Self-study: 76

Assessment: Exam

Division: Nuclear Fuel Cycle

Director of Programme _____ / Vera V. Verkhoturova

Instructor _____ / Yury M. Cherepennikov

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Course Name: Radiation safety in medical applications

Course Overview

Course Objectives	The objective of the course is to form a set of competences (learning outcomes) to prepare students for operational and engineering activities involving application of methods for dosimetry and radiation protection, radiation safety standards and approaches for prevention and control of the consequences of radiation incidents to provide radiation safety assurance.
Learning Outcomes	**Upon completion of the course, a graduate is expected to acquire the knowledge of**: – methods of systemic and critical analysis – goals and objectives of scientific research in the direction of the professional activity, basic principles and methods to provide them – methods and instruments of dosimetry and radiometry, rules for registration of measurement results in accordance with the requirements of the relevant standards and regulatory documents. – examples of typical radiation emergencies; – radiation safety standards, methods of calculating protection against charged particles, against gamma and neutron radiation – regulatory documents in the field of radiation safety and radiation monitoring **Graduates are also expected to develop the following skills**: – to apply the methods of a systematic approach and critical analysis of problem situations; – general planning for work on a direction, propose research methods and methods for processing results – development of emergency planning and response arrangements – planning protection against charged particles, against gamma and neutron radiation, assess the radiation conditions, simulate radiation transfer – conduct research according to the plan agreed with line manager, present the results – select and use measuring instruments in accordance with the task, present the measurement results in accordance with the requirements of the relevant standards and regulations – develop documents to radiation safety assurance of the departments for radiation therapy, radiation diagnostics, interventional radiology and radionuclide diagnostics and therapy **Graduates should acquire the practical experience in**: – systemic and critical analysis of problem situations – future professional activities – selection of the necessary measuring instruments for individual dosimetric control and radiation monitoring of the environment – identification of radiation incidents sources – comparison, analysis and interpretation of the main requirements of regulatory documents for radiation safety assurance of the departments radiation therapy, radiation diagnostics, interventional radiology and radionuclide diagnostics

	and therapy
Course Outline	The target course is taught using a variety of teaching forms, including lectures, practical experience and learners' self-study. The course includes the following mandatory components: – 8 lectures; – 8 practical experiences; – 2 tests (in a written form). Radiation safety assurance: – Basic concepts and standards of radiation safety (lectures –8 hours, seminars – 8 hours); – Radiation safety assurance (lectures –8 hours, seminars – 8 hours).
Prerequisites (if available)	1. Dosimetry and protection from ionizing radiation 2. Nuclear Physics 3. Radiation Physics
Course Structure	The target course consists of the two sections. **Section 1. Basic concepts and standards of radiation safety** Characteristics of ionizing radiation sources and radiation fields. Conceptual basis for standardization in radiation safety. Radiation safety standards **Section 2. Radiation safety assurance** Radiation safety assurance for humans and environment. Prevention and control of the consequences of radiation incidents
Facilities and Equipment	Lecture hall with multimedia equipment: 634050, Tomsk, 2, Lenina ave., building 10, room 228, room 340.
Grading Policy	In accordance with the 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). Max score for current assessment is 40 points, min – 24 points. The final rating is determined by summing the points of the current assessment during the semester and credit test scores at the end of the semester. Maximum overall rating corresponds to 100 points, min pass score is 55 points.
Course Policy	Class attendance will be taken into consideration when evaluating students' participation in the course / students are expected to actively engage in class discussions about the assigned readings. Attendance is strictly controlled. All classes require obligatory presence.
Teaching Aids and Resources	**Compulsory reading:** 1. 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. 2. Domenech H. Radiation Safety Management and Programs / H. Domenech. – Cham : Springer International Publishing, 2017. – 334 p. – Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-3-319-42671-6 (дата обращения: 20.09.2020). – Режим доступа: из корпоративной сети ТПУ. 3. Prince R. Radiation Protection at Light Water Reactors / R. Prince. – Berlin :

	Springer-Verlag, 2012. – 372 p. – Текст: электронный // SpringerLink. – URL: https://link.springer.com/book/10.1007/978-3-642-28388-8 (дата обращения: 20.09.2020). – Режим доступа: из корпоративной сети ТПУ. 4. Marguet, S. The Physics of Nuclear Reactors / S. Marguet. — Cham : Springer International Publishing AG, 2017. — 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: из корпоративной сети ТПУ. **Additional reading:** 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: из корпоративной сети ТПУ.
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