**Al-Farabi Kazakh National University**

**Faculty of Physics and Technology**

**Chair of Theoretical and Nuclear Physics**

**Syllabus**

**Spring semester, 2017-2018 academic year**

**Academic course information**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Discipline’s code | Discipline’s title | | Type | No. of hours per week | | | | Number of credits | | ECTS |
| Lect. | Pract. | | Lab. |
| TRB 7303 | Technology of radiation safety | | Elective | 2 | 1 | | 0 | 3 | | 5 |
| Lecturer | | Takibayev N.Zh., d.s.p.-m., academic of NAS RK, professor | | | | Office hours | | | Scheduled | |
| e-mail | | E-mail: [takibayev@gmail.com](mailto:takibayev@gmail.com) | | | |
| Telephone number | | Telephone: 2925-133; 8-777-704-0396 | | | | Auditory | | | 319 | |

|  |  |
| --- | --- |
| Academic presentation of the course | **Type of course** (theoretical, practical; basic, elective) and its purpose (role and place of the course in the educational program): Technology of radiation safety  **The aim of the course:** to inform doctoral students about the theory of safety with radiation elements or with nuclei, the theory of the characteristics of radiation nuclei.\*  A) be able to – demonstrate acquired knowledge (specifically) and it’s understanding; - demonstrate an understanding of the overall structure of the study field and the relations between its elements (specifically);  B) be able to – include new knowledge in the context of basic knowledge, interpret its contents; - analyze educational situation and offer direction to solve it; - use methods (research, calculation, analysis, etc.) inherent to the field of study (specifically) individually or in a group teaching and research activities;  C) be able to - synthesize, interpret and evaluate the learning outcomes of discipline, modules, midterm exam content (specifically);  D) be able to – constructive educational and social interaction and cooperation in the group; - propose to consider a problem, to reason its importance; - accept criticism and to criticize; - work in a team;  E) be able to – recognize the role of taken course in the implementation of individual learning paths. \*The system of descriptor verbs must be used during the formation of competences \*\*Active and interactive methods is recommended to ensure deeper understanding and learning of educational material and to achieve learning out comes of the course (individual researches, group projects, case studies and there methods). |
| Prerequisites | Organization and planning of research |
| Post requisites | It is necessary in a future professional practice |
| Information resources | Literature (with an indication of the authors and data output), the availability (number), software and consumables with information about where you can get them. (8-9) Recommended:   1. Zanzonico P. Routine Quality Control of Clinical Nuclear Medicine Instrumentation: A Brief Review. J Nucl Med. 2008;49(7):1114–1131 2. ["Radiation"](http://www.thefreedictionary.com/radiation). The free dictionary by Farlex. Farlex, Inc. Retrieved 2014-01-11. 3. Moulder, John E. ["Static Electric and Magnetic Fields and Human Health"](https://web.archive.org/web/20070714054650/http:/www.mcw.edu/gcrc/cop/static-fields-cancer-faq/toc.html).   Additional:   1. Mozumder, A., and Y. Hatano. Charged Particle and Photon Interactions with Matter: Chemical, Physicochemical, and Biological Consequences with Applications*.* New York: Marcel Dekker, 2004. Print. 2. Petrucci, Ralph H., William S. Harwood, F. Geoffrey. Herring, and Jeffry D. Madura. General Chemistry: Principles and Modern Applications. Upper Saddle River, N.J.: Pearson Education, 2007. Print. |
| Academic policy of the course in the context of university moral and ethical values | **Academic Behavior Rules:**  Compulsory attendance in the classroom, the impermissibility of late attendance. Without advance notice of absence and undue tardiness to the teacher is estimated at 0 points.  **Academic values:**  Inadmissibility of plagiarism, forgery, cheating at all stages of the knowledge control, and disrespectful attitude towards teachers. (The code of KazNU Student’s honor) |
| Evaluation and attestation policy | **Criteria-based evaluation:**  Assessment of learning outcomes in correlation withdescriptors (verification of competence formation during midterm control andexaminations).  **Summative evaluation:**  evaluation of the presence and activity of the work in the classroom; assessment of the assignment, independent work of students, (project / case study / program / ...)  The formula for calculating the final grade.  Below are the minimum estimates in percentage terms:  9 5% - 100%: А 90% - 94%: А-  85% - 89%: В+ 80% - 84%: В 75% - 79%: В-  70% - 74%: С+ 65% - 69%: С 60% - 64%: С-  55% - 59%: D+ 50% - 54%: D- 0% -49%: F |

Calendar (schedule) the implementation of the course content**:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Weeks** | Topic title (lectures, practical classes, Independent work of students) | Number of hours | Maximum score |
| **Module 1** | | | |
| **1** | Lecture-1 (L-1). Introduction to Radiation | **2** | - |
| Seminar -1 (S-1). List of radiation elements and characteristics | **1** | 5 |
| **2** | L-2. [Ionizing radiation](https://en.wikipedia.org/wiki/Radiation#Ionizing_radiation): [Ultraviolet radiation](https://en.wikipedia.org/wiki/Radiation#Ultraviolet_radiation) | **2** | - |
| S-2. X-ray | **1** | 5 |
| **3** | L-3. Gamma, alpha, beta and radiation | **2** | - |
| S-3. Other Classifications of radiations | **1** | 5 |
| DSWT 1. Prepare the report: Classification of radiations | **1** | 20 |
| **4** | L-4. Radioactivity in material | **2** | - |
| S-4. Types of radioactivity materials | **1** | 5 |
| **Module 2** | | | |
| **5** | L-5. Working with radiation | **2** | **-** |
| S-5. **Guiding principles** | **1** | 5 |
| DSWT 2. **Guiding principles:Justification, Optimisation, limitation** | **1** | 20 |
| **6** | L.-6.  [**Risk control when we work**](https://en.wikipedia.org/wiki/Nuclear_reactor#Classification_by_type_of_nuclear_reaction) | **2** | - |
| S.-6. Safety theory | **1** | 5 |
| **7** | L.-7. Physical Forms of Radiation | **2** | - |
| S.-7. [Future and developing technologies](https://en.wikipedia.org/wiki/Nuclear_reactor#Future_and_developing_technologies) of radiation | **1** | 5 |
| DSWT 3. Prepare the report: How to work with radioactive materials: emergency, security. mechanism | **1** | 25 |
| **1stIntermediate Control (IC1)** |  | **100** |
| **8** | **Midterm (MT)** |  | **100** |
| **8** | L-8. Nuclear Fission | **2** | - |
| S-8. [Nuiclear](https://en.wikipedia.org/wiki/Nuclear_reactor#Natural_nuclear_reactors) interactions | **1** | 5 |
| **Module 3** | | | |
| **9** | L-9. Units of radiation intensity | **2** | - |
| S-9. Biological effects of radiation. | **1** | 5 |
| DSWT 4. Biological effects of radiation. | **1** | 10 |
| **10** | L-10. [Radiation](http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/nuclear-power-reactors.aspx#ECSArticleLink2) protection | **2** | - |
| S-10**.** [External/internal](http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/nuclear-power-reactors.aspx#ECSArticleLink1) radiation exposure | **1** | 5 |
| **11** | L-11. Radiation Survey meters | **2** | - |
| S-11. Dose rate meter | **1** | 5 |
| DSWT 5. Types of Radiation Survey meters. | **1** | 10 |
| **12** | L-12. Laboratory rules | **2** | - |
| S-12 Security | **1** | 5 |
| **13** | L-13. Emergency procedures | **2** | - |
| S-13**.** Area decontamination | **1** | 5 |
| DSWT 6. Prepare the report: Emergency procedures | **1** | 20 |
| **14** | L-14. Radioactive waste | **2** | - |
| S-14. Classification of waste | **1** | 5 |
| **15** | L-15**.** Sum of the Radiation | **2** | - |
| S-15**.** radiation worker | **1** | 5 |
| DSWT 7. Prepare the report: How to work: emergency, security | **1** | 25 |
| **2nd Intermediate Control (IC2)** |  | **100** |
|  | **Exam** |  | **100** |
|  | **Total** |  | **100** |
| **Note: Independent work of students with teacher is 7 hours for semester. 3, 5, 7, 9, 11, 13 and 15 weeksareincludedintosyllabus (assignmentsubmission)** | | | |

Lecturer\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_TakibayevN.Zh.

Head of the Department\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Abishev M.E.

Chairman of the Faculty Methodical Bureau\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A.T.Gabdullina A.T.