Al-Farabi Kazakh National University
Faculty of Physics and Technology
Department of Theoretical and Nuclear Physics

APPROVED by
Dean of Faculty
Davletov A.E.
09 09 2017

EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE

OPSF 5301 « Basic principles of Modern Physics »

Specialty "6M060400 – Physics"
Educational program "on specialty 6M060400 – Physics "

Course – 1
Semester – 2
Number of credits – 2

Almaty 2017

Educational-methodical complex of the discipline is made by Takibayev N.Zh., d.s.p.-m., academic of NAS RK, professor lecturer (name, surname, scientific degree, academic rank)

Based on the working curriculum on the specialty "5B060400 – Physics"

Considered and recommended at the meeting of the department Theoretical and Nuclear Physics

from «_05__» ___09___ 2017 year, protocol № 2

Head of department _____ Abishev M.E.
(Signature)

Recommended by methodical bureau of the faculty

«__06__» __09__ 2017 year, protocol № 1

Chairman of the method bureau of the faculty _____ Gabdullina A.T.
(Signature)

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

Code of the discipline	Title of the discipline	Type	The number of hours per week			The number of credits	ECTS
			Lec-tures	Practi-cal hours	Labora tory hours		
OPSF 5301	Basic principles of Modern Physics	Basic	1	1		2	3

Lecturer	Takibayev Nurgali Zhabagayevich, d.s.p.-m., academic of NAS RK, professor	Office hours	Scheduled
e-mail	E-mail: takibayev@gmail.com		
Telephone number	Телефон: 87777040396	Lecture room	319

Academic presentation of the course	**Type of training course** (theoretical, practical, basic, elective) and its purpose (role and place of the course in the EP): **The purpose of the course:** to form a system of competences in the context of the qualification requirements of the specialty: * A) be able to demonstrate the knowledge gained and their understanding in nuclear physics, nuclear technology; demonstrate an understanding of the factors that determine the properties of materials, the development of modern nuclear technology and the relationship between their real structure and properties. B) be able to interpret the main nuclear technologies used in solving scientific and technical problems and possible ways to improve them, be able to analyze the structure of nuclear installations. C) the ability to synthesize and evaluate your own research in the context of one of the paradigms and present it in the form of a presentation. D) to be able to share the results of the research with the scientific community, enter into a dialogue, have reason to defend their point of view, have the skills of an organizer and be able to work in a team. E) be able to assess the significance of the results obtained in their own professional development and in the development of the scientific foundations of physics.
Prerequisites	Nuclear physics. Nuclear materials.
Post-requisitions	Physics of energy processes
Literature and 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". The free dictionary by Farlex. Farlex, Inc. Retrieved 2014-01-11. 3. Moulder, John E. "Static Electric and Magnetic Fields and Human Health". 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. 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	**Rules of academic behavior:** Obligatory presence in the classroom, inadmissibility of late arrivals. Absence and delay in classes without prior warning of the teacher are estimated at 0 points. Mandatory compliance with the deadlines for the implementation and delivery of the CDS assignments according to the schedule of the discipline. The form of delivery of the CDS assignments (orally, in the form of an abstract or presentation) is presented in the system: univer.kaznu.kz. In case of violation of the deadlines, the task is evaluated taking into account the deduction of penalty points. **Academic values:** Academic honesty and integrity: independence of all tasks; inadmissibility of plagiarism, forgery, use of cribs, cheating at all stages of knowledge control, cheating the teacher and disrespectful attitude towards him. (Code of Honor of a student of KazNU)
Evaluation and appraisal policy	**Criterial evaluation:** evaluation of learning outcomes in correlation with descriptors (checking the formation of competencies at the boundary control and examinations). **Summative evaluation:** Evaluation of the presence and activity of work in the classroom; evaluation of the completed CPC task, completed control work, colloquium. The formula for calculating the final grade. Final grade for the discipline $= \frac{IC1 + IC2}{2} \cdot 0,6 + 0,1MT + 0,3FC$ Below are the minimum estimates in percentage terms: 95% - 100%: A 90% - 94%: A- 85% - 89%: B+ 80% - 84%: B 75% - 79%: B- 70% - 74%: C+ 65% - 69%: C 60% - 64%: C- 55% - 59%: D+ 50% - 54%: D- 0% -49%: F

Calendar for the implementation of the content of the training course:

Week / date	Title of the topic (lecture, practical lesson, SRMP)	Hours	The maximum score
1	2	2	5
1	Lecture 1. History of the nuclear physics. Types of nuclear reactions and physical fundamentals.	1	

	Practical work 1. Nuclear technologies	1	5
2	Lecture 2. Production of electrical and heat energy.	1	
	Practical work 2. Production of electrical and heat energy.	1	5
3	Lecture 3. Basic nuclear-physical concepts.	1	
	Practical lesson 3. Basic nuclear-physical concepts.	1	5
	DSWT 1: Prepare the report: "Nuclear energy in the world. Conditions and prospects »	1	20
4	Lecture 4. Nuclear Reactors.	1	
	Practical work 4. Types of nuclear reactors.	1	5
5	Lecture 5. The main structural units of hulls and process equipment	1	
	Practical work 5. The main structural units of hulls and process equipment	1	5
	DSWT 2: Prepare the report: "The basic nuclear-physical concepts."	1	20
6	Lecture 6. Requirements for radiation resistance of structural materials and fuel	1	
	Practical 6. Requirements for radiation resistance of structural materials and fuel	1	5
7	Lecture 7. Nuclear-energy transport installations.	1	
	Practical work 7. Nuclear power transport installations.	1	5
	DSWT 3: "The main types of nuclear reactors"	1	25
	1st Intermediate Control (IC1)		**100**
8	**Midterm (MT)**		**100**
8	Lecture 8. Nuclear-propulsion systems in space.	1	
	Practical exercise 8. Nuclear-propulsion systems in space.	1	5
9	Lecture 9. Irradiated nuclear fuel and technical practice of radioactive waste management.	1	
	Practical session 9. Irradiated nuclear fuel and technical practice of radioactive waste management.	1	5
	DSWT 4: Prepare the report: "Prospects of the atomic industry of Kazakhstan".	1	15
10	Lecture 10. The main types of accelerators of charged particles.	1	
	Practical lesson 10. The main types of accelerators.	1	5
11	Lecture 11. Application of accelerators in science and industry.	1	
	Practical session 11. Application of accelerators in science and industry	1	5

	DSWT 5: Prepare the report: "Application of accelerators in science and industry"	1	20
12	Lecture 12. Radiation and its impact on the living organism.	1	
	Practical 12. Radioactivity. Natural and artificial radioactivity	1	5
13	Lecture 13. Radioactive Isotopes and Ionizing Radiation	1	
	Practical lesson 13. Radioactive isotopes and ionizing radiation.	1	5
	DSWT 6: Prepare the report: "Alpha, Beta and gamma radiation»	1	10
14	Lecture 14. Use of nuclear technology for peaceful purposes.	1	
	Practical exercise 14. Use of nuclear technology for peaceful purposes.	1	5
15	Lecture 15. Development of nuclear technology in Kazakhstan.	1	
	Practical session 15. Development of nuclear technology in Kazakhstan.	1	5
	DSWT 7: Prepare the report: "Radioactive isotopes in medicine, in agriculture"	1	15
	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 _____ Takibayev N.Zh.

Head of the Department _____ Abishev M.E.

Chairman of the Faculty Methodical Bureau _____ Gabdullina A.T.