Syllabus

on discipline (TECh 5309) The theory of elementary particles
for specialty **"6M060400-Physics"**

Spring semester, 2017-2018 academic year,

Course 2

Academic course information

Discipline's code	Discipline's title	Type	No. of hours per week			Number of credits	ECTS
			Lect.	Pract.	Lab.		
TECh 5309	The theory of elementary particles	Elective	1	1	0	2	3

Lecturer	TakibayevN.Zh., d.s.p.-m., academic of NAS RK, professor	Office hours	Scheduled
e-mail	E-mail: takibayev@gmail.com		
Telephone number	Telephone: *2925-133; 8-777-704-0396*	Auditory	319

Academic presentation of the course	**Typeofcourse**"The theory of elementary particles" iselective componentanditspurpose: TheoreticalPhysics. **The aim of the course:** to learn to form a system of competences in the context ofqualification requirements.As a result of the discipline, the student will be able to: – 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 a0 group teaching and research activities; – synthesize, interpret and evaluate the learning outcomes of discipline, modules, midterm exam content (specifically); – 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; – 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 outcomes of the course (individual researches, group projects, case studies and there methods).
Prerequisites	Mathematical analysis, the theory of functions of complex variables, differentialequations, mathematical physics, statistical physics, physics of elementaryparticles.
Post requisites	Taken knowledge will be used in research work.
Information resources	Literatures (with an indication of the authors and data output), the availability(number), software and consumables with information about where you can getthem. 1. A. Bettini, Introduction to Elementary Particle Physics, Cambridge University Press, 2008. 2. M. Thomson, Modern Particle Physics, Cambridge University Press, 2013. 3. C. Amsler, Nuclear and Particle Physics, IOP Publishing, Bristol, 2015. 4. D.H. Perkins, Introduction to High Energy Physics, Cambridge

	University Press, 2000. Hochenergiephysik, Addison-Wesley, 1990. (out of press) 5. B. Povh u.a., Teilchen und Kerne, Springer, 8. Auflage, 2009. (Paperback) Encyclopedia of Applied High Energy and Particle Physics, Ed. R. Stock, Wiley 2009. 6. Y. Nagashima, Elementary Particle Physics. Wiley. Vol. 1: Quantum Field Theory, 2010. Vol. 2: Foundations of the Standard Model, 2013. 7. R. Cahn, G. Goldhaber, The Experimental Foundations of Particle Physics, Cambridge Univ. Press, 2009
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. The formula for calculating the final grade. $$\text{Final grade for the discipline} = \frac{\text{IC1} + \text{IC2}}{2} \cdot 0{,}6 + 0{,}1\text{MT} + 0{,}3\text{FC}$$ Below are the minimum estimates in percentage terms: 5% - 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 (schedule) the implementation of the course content**:**

Weeks	Topic title (lectures, practical classes, MSWT)	Number of hours	Maximum score
	Module 1		
1	Lecture-1 (L-1). Particles and fields. Brief overview of empirical material.	**1**	-
	Seminar -1 (S-1).Elementary particles.	**1**	*5*
2	L-2.Elementary particles and the universe.	**1**	-
	S-2.Cosmological singularity.	**1**	*5*
3	L-3. Evolution of the Universe.	**1**	-
	S-3.Relic radiation.	**1**	5
	MSWT 1. Assignment submission № 1: Evolution of the Universe.	**1**	20
4	L-4. Regularities of fundamental interactions.	**1**	-
	S-4. Quantum properties of particles. Spin. Isospin.	**1**	*5*
	Module 2		
5	L-5. Elementary particles and stars.	**1**	-
	S-5.Properties of neutrinos.	**1**	5

	MSWT 2 Assignment submission № 2: Neutron stars.	**1**	20
6	L.-6.Neutron stars.	**1**	-
	S.-6. Collapse of the star.	**1**	5
7	L.-7.Discrete symmetries.	**1**	-
	S.-7. Fundamental interactions.	**1**	5
	MSWT 3. Assignment submission № 3: Internal hadron symmetry and quark model.	**1**	25
	1st Intermediate Control (IC1)		**100**
8	**Midterm (MT)**		**100**
8	L-8.Internal hadron symmetry and quark model.	**1**	-
	S-8.Isotopic symmetry.	**1**	5
Module 3			
9	L-9. Quark model: additional symmetries.	**1**	-
	S-9. Symmetries of hadron physics.	**1**	5
	MSWT4. Assignment submission № 4: Quark model: additional symmetries.	**1**	10
10	L-10. The standard model.	**1**	-
	S-10**.** Main conclusions and possibilities of development of the standard model.	**1**	5
11	L-11. Dynamic symmetry breaking and technical-color models.	**1**	-
	S-11.Composite particles. Leptons. Quarks.	**1**	5
	MSWT5. Assignment submission № 5: Dynamic symmetry breaking and technical-color models.	**1**	10
12	L-12.Lepton-nucleon scattering and the quark model.	**1**	-
	S-12. The structure of hadrons and hadron-hadron interactions.	**1**	5
13	L-13. Calibration fields.	**1**	-
	S-13. Quantum gauge theories.	**1**	5
	MSWT 6. Assignment submission № 6: Calibration fields.	**1**	20
14	L-14.Spontaneous violation of global and local symmetries.	**1**	-
	S-14.The Higgs mechanism. The Salam-Weinberg model.	**1**	5
15	L-15**.**Experimental methods.	**1**	-
	S-15**.** Modern experimental installations.	**1**	5
	MSWT7. Assignment submission № 7: Modern experimental installations.	**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_____Gabdullina A.T.