

**Al-Farabi Kazakh National University
Physico Technical Faculty
Department of Theoretical and Nuclear Physics**

**APPROVED by
Dean of Faculty**

 " 09 " 09 2017 Davletov A.E.

EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE

YaVPZM 7301 «Nuclear interactions in high density matter»

Specialty "6D060500 – Nuclear Physics"
Educational program "on specialty 6D060500 – Nuclear Physics"

Course – 1
Semester – 1
Number of credits – 3


Almaty 2017

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


Based on the working curriculum on the specialty "6D060500 – Nuclear 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.Y.
(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

Discipline's code	Discipline's title	Type	No. of hours per week			Number of credits	ECTS
			Lect.	Pract.	Lab.		
YaVPZM 7301	Nuclear interactions in high density star matter	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						
Telephone number	Telephone: 2925-133; 8-777-704-0396		Auditory		319		

Academic presentation of the course	<p>Type of course (theoretical, practical; basic, elective) and its purpose (role and place of the course in the educational program): Nuclear interactions in high density star matter.</p> <p>The aim of the course: to acquaint the doctoral student with stellar matter, about the nuclear reactions taking place in this environment, the theory of the phenomenon in stellar matter:*</p> <p>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);</p> <p>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;</p> <p>C) be able to - synthesize, interpret and evaluate the learning outcomes of discipline, modules, midterm exam content (specifically);</p> <p>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;</p> <p>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 (Look in Application 2) **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).</p>
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

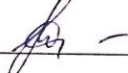
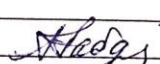
	<p>them. (8-9)</p> <p>Recommended:</p> <ol style="list-style-type: none"> 1. Cotnikova R. T, Klimushkin DY. Fundamentals of stellar evolution and cosmology. Irkutsk: RIO 1998. 2. Cotnikova R. T Astrophysics. Irkutsk.: RIO 2005. 3. Martynov D. Y. Course of General Astrophysics. M.: Nauka, 1984. 4. Sobolev V. Course of Theoretical Astrophysics. M.: Nauka, 1987 <p>Additional:</p> <ol style="list-style-type: none"> 1. N.G Bochkarev Magnetic fields in space. M.: Nauka, 1985. 2. Vorontsov - Velyaminov B. A. Extragalactic astronomy. M.: Nauka, 1978. 3. Gershberg R. E. Active solar-type main sequence stars. Odessa: Astroprint 2002. 												
Academic policy of the course in the context of university moral and ethical values	<p>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.</p> <p>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)</p>												
Evaluation and attestation policy	<p>Criteria-based evaluation: Assessment of learning outcomes in correlation with descriptors (verification of competence formation during midterm control and examinations).</p> <p>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 / ...)</p> <p>The formula for calculating the final grade.</p> $\text{Final grade for the discipline} = \frac{IC1 + IC2}{2} \cdot 0,6 + 0,1MT + 0,3FC$ <p>Below are the minimum estimates in percentage terms:</p> <table> <tr> <td>5% - 100%: A</td> <td>90% - 94%: A-</td> <td></td> </tr> <tr> <td>85% - 89%: B+</td> <td>80% - 84%: B</td> <td>75% - 79%: B-</td> </tr> <tr> <td>70% - 74%: C+</td> <td>65% - 69%: C</td> <td>60% - 64%: C-</td> </tr> <tr> <td>55% - 59%: D+</td> <td>50% - 54%: D-</td> <td>0% -49%: F</td> </tr> </table>	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
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55% - 59%: D+	50% - 54%: D-	0% -49%: F											

Calendar (schedule) the implementation of the course content:

Wee ks	Topic title (lectures, practical classes, Independent work of students)	Number of hours	Maximum score
Module 1			
1	Lecture-1 (L-1). Stars and interstellar medium.	2	-
	Seminar -1 (S-1). The birth of stars. Study interstellar medium.	1	5
2	L-2. Galaxies and quasars.	2	-
	S-2. Galaxies and quasars.	1	5

3	L-3. Basic physical laws.	2	-
	S-3. The use of physical laws to the study of space objects (stars, cosmic plasma) and the universe as a whole.	1	5
	DSWT 1. Prepare the report: The use of physical laws to the study of space objects (stars, cosmic plasma) and the universe as a whole.	1	20
4	L-4. Sources of stellar energy.	2	-
	S-4. Renewable energy sources.	1	5
Module 2			
5	L-5. Interaction of radiation with matter.	2	-
	S-5. Elementary bases of the interaction of matter and radiation.	1	5
	DSWT 2. Prepare the report: Elementary basis of the interaction of matter and radiation.	1	20
6	L-6. Radiative transfer equation and its simple solutions.	2	-
	S-6. Consideration of problems using the transfer equation.	1	5
7	L-7. Physical processes in celestial sources of radiation.	2	-
	S-7. Nuclear reactions in stars and other astronomical objects.	1	5
	DSWT 3. Prepare the report: Nuclear reactions in stars and other astronomical objects.	1	25
	1st Intermediate Control (IC1)		100
8	Midterm (MT)		100
8	L-8. The theory of interactions.	2	-
	S-8. The interactions and reactions of two-particle and three-particle types	1	5
Module 3			
9	L-9. Energy and mechanisms of nuclear fission.	2	-
	S-9. Thermonuclear reactions, thermonuclear bomb.	1	5
	DSWT 4. Prepare the report: Thermonuclear reactions, thermonuclear bomb.	1	10
10	L-10. The luminosity of stars and their mass.	2	-
	S-10. The explosions of supernovae, quasars, pulsars, neutron stars.	1	5
11	L-11. Modern theoretical ideas about the nature of stars and their systems.	2	-
	S-11. Modern problems of astrophysics.	1	5
	SSWT 5. Prepare the report: Modern problems of astrophysics.	1	10
12	L-12. Physical methods of research of space objects.	2	-
	S-12 The use of the achievements of nuclear physics to the study of cosmic phenomena.	1	5
13	L-13. Current problems in astrophysics.	2	-
	S-13. The latest discoveries and developments in	1	5

	the study of the universe in recent years.		
	DSWT 6. Prepare the report: The latest discoveries and developments in the study of the universe in recent years.	1	20
14	L-14. Nuclear reactions in astrophysical objects.	2	-
	S-14. Nuclear reactions in astrophysical objects.	1	5
15	L-15. Databases on nuclear reactions.	2	-
	S-15. Databases on nuclear reactions.	1	5
	DSWT 7. Prepare the report: Astrophysical observations.	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 weeks are included in the syllabus (assignment submission)			

Lecturer _____  Takibayev N. Zh.
Head of the Department _____ Abishev M.E.
Chairman of the Faculty Methodical Bureau  A.T. Gabdullina A.T.