

The Midterm Exam program  
on the discipline «**Introduction to the theory of the core**» for students of the fourth year of the  
speciality «5B060400 – Physics»

The proposed Midterm Exam program on discipline «**Introduction to the theory of the core**» is made according to the discipline syllabus. The program determines the requirements for the levels of mastering the academic discipline: what the student should have *an idea* after studying the course for 7 weeks, which should know what *skills* and *habits* should be formed.

At Midterm Exam, students will be asked two theoretical questions and one task.

**Midterm addresses the following questions:**

1. Gravitational interaction.
2. Characteristics of fundamental interactions.
3. Weak interaction.
4. Decay of atomic nuclei.
5. Electromagnetic interaction.
6. The Weinberg-Salam-Glashow theory.
7. Strong interaction.
8. The potential of Yukawa.
9. Some problems in the physics of elementary particles.
10. Quantum chromodynamics.
11. The concept of mass in modern physics.
12. Physical experiment: current state and development prospects.
13. Some achievements of experimental physics.

**BIBLIOGRAPHY**

**Basic:**

1. Bethe H.A., Morrison P. Elementary Nuclear Theory, 1st ed. New York: Wiley, 1947. 147 p.
2. Heyde K. Basic Ideas and Concepts in Nuclear Physics: An Introductory Approach, 2nd Edition. Institute of Physics Publishing Bristol and Philadelphia, 1999. 547 p.
3. Kamal A. Nuclear Physics, Springer, 2014. — 612 p. — (Graduate Texts in Physics).
4. Iliadis Ch. Nuclear Physics of Stars, WILEY-VCH Verlag, Weinheim, 2007, 666 pages
5. Martin B.R. Nuclear and Particle Physics: An Introduction, Wiley, 2006. — 415 p.
6. Takigawa N., Washiyama K., Fundamentals of Nuclear Physics, Springer, Japan, 2017. – 277 p.

**Additional:**

1. Shultis J.K., Faw R.E. Fundamentals of Nuclear Science and Engineering, Kansas State University Manhattan, Marcel Dekker, New York, Basel, 2002, 506 pp.
2. Frobrich P., Lipperheide R., Theory of nuclear reactions, Clarendon Press, Oxford. 1996 - 476 p.
3. J.M.Blatt and V.F.Weisskopf, Theoretical Nuclear Physics, Springer, 1979, VII.5
4. Nuclear Physics by Irving Kaplan 2nd edition 1962 Addison-Wesley