

Name of the entrance exam
Nuclear power engineering
Field/fields of study
14.04.01 Nuclear power engineering and thermal physics
Educational program/programs
14.04.01_03 Nuclear Power Engineering (international education program)
Abstract
<p>The program contains a list of topics (questions) in the disciplines of the basic part of the professional cycle of the bachelor's degree curriculum in the field of 14.04.01 Nuclear power engineering and thermal physics, included in the content of tickets (test tasks) for the entrance examinations to the magistracy.</p> <p>The entrance test is evaluated on a one-hundred-point scale and consists of an interdisciplinary exam in the scope of the requirements imposed by the state educational standards of higher education for the bachelor's degree level in the field corresponding to the master's degree, conducted in person in writing or remotely (the maximum score is 100). The minimum number of points confirming its successful completion is set by the Admission Rules approved for the current academic year.</p> <p>The duration of the test is 90 minutes.</p> <p>It is allowed to use writing materials, a draft, and a calculator during the entrance test.</p>
Disciplines included in the program of entrance examinations for the Master's degree program
<ol style="list-style-type: none"> 1. Nuclear physics and theory of neutron transfer 2. Thermodynamics and heat-and-mass transfer 3. Fluid and gas mechanics 4. Language proficiency
Content of academic disciplines
<ol style="list-style-type: none"> 1. Nuclear physics and theory of neutron transport <ol style="list-style-type: none"> 1. Structure of atomic nuclei 2. Radioactivity 3. Nuclear reactions 4. Nuclear interactions and macroscopic cross-sections of interaction 5. Mechanisms of interaction with neutrons 6. Full macroscopic cross-section 7. Doppler effect 8. Neutron diffusion, Fick's law 9. Diffusion equation 10. Neutron deceleration 11. The age equation <p>References</p> <ol style="list-style-type: none"> 1. Fundamentals of theory and calculation methods for nuclear power reactors [Text]: Textbook. manual for universities / Ed. G.A. Batya. - M.: Energoizdat, 1982. -- 511 p. 2. Feinberg, S.M. The theory of nuclear reactors [Text]: textbook. for universities / S.M. Feinberg, S.B. Shikhov, V.B. Trojan. - M.: Atomizdat, 1978. -- 400 p. 3. Lamarsh, J.R., Introduction to Nuclear Reactor Theory. New York: Addison-Wesley Publishing Company, 2002. 2. Thermodynamics and heat-and-mass transfer <ol style="list-style-type: none"> 1. Laws of thermodynamics. Thermodynamic processes and cycles; 2. Real gases. Water vapor. Wet air; 3. Thermodynamics of flows; 4. Thermodynamic analysis of cycle efficiency; 5. Phase transitions; 6. Thermodynamic cycles of steam turbine and gas turbine plants. Cycles of combined cycle plants; 7. Theory of heat transfer: thermal conductivity, convection, radiation; 8. Calculation of heat transfer processes; 9. Refrigeration and cryogenic equipment; 10. Intensification of heat transfer; 11. Fuel and combustion basics; 12. Application of heat in the industry; 13. Secondary energy resources <p>References</p> <ol style="list-style-type: none"> 1. Kirillin V.A. Technical Thermodynamics / Kirillin V.A. Sychev V.V. Sheindlin A.E. M.: Energoatomizdat, 1983. - — 416 c. 2. Isachenko V.P. Heat Transfer / V.P. Isachenko, V.A. Osipova, A.S. Sukomel Publishing House. 4-th transfer and addition. - Moscow: "Energoizdat", 1981. - 415 c. 3. Holyst, R., Poniewierski A., Thermodynamics for Chemists, Physicists and Engineers. New York: Springer, 2012; 4. Incropera, Frank P. et al. Fundamentals of heat and mass transfer. John Wiley & Sons, Inc., 2007. 3. Fluid and gas mechanics

1. Models of a liquid medium; Newtonian and rheological fluids;
2. Hydrostatics: Euler's equations, the basic formula of hydrostatics, pressure on the walls; relative peace of the environment;
3. Forces acting in a fluid, normal and tangential stresses, stress tensor; equation of motion in stresses; general laws and equations of fluid dynamics: integral form of conservation laws, generalized Newton's hypothesis, Navier-Stokes equation, boundary and initial conditions;
4. Modes of flow; the concept of the boundary layer; ideal fluid model; Bernoulli's equation; similarity of hydrodynamic processes and dimensional analysis;
5. One-dimensional flow model; loss of pressure, flow in pipes, outflow of liquid and gas through holes and nozzles, gas-dynamic functions of flow; supersonic movement of gases;
6. Equation of one-dimensional unsteady motion.

References

1. L.G. Loitsyanskiy Mechanics of liquid and gas - 7th ed. - Moscow: Drofa, 2003. - — 840 c
2. Shvydkiy V.S. Fluid and Gas Mechanics / Shvydkiy V.S., Yaroshenko Yu.G., Gordon Ya.M., Shavrin V.S., Noskov A.S. 2nd ed. and additional Moscow: Academkniga IKC Publishing House, 2003. - 464 c.
3. Durst, F., An Introduction to the Theory of Fluid Flows. Springer, 2008.

4. Language proficiency

Ability to produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

References

1. <https://www.ielts-writing.info/EXAM/>
2. Complete IELTS. Bands 6-7, Brook-Hart Guy

Entrance exam assessment criteria

The final score is determined by the percentage scored from the maximum number of test points, the essay is evaluated according to the following criteria: disclosure of the topic, the volume of the text, the volume of the original text.

Assigned group

Chairman of the Subject Committee:
Director of IE, V.V. Barskov.

Compiled by:
Educational program manager V.Ya. Vladimirov.