Concepts of Modern Natural Science

Spring Semester 2018

1. Kinematics in the Special Theory of Relativity. Basic Notions of Prerelativistic Physics.
2. Einstein's Postulates of Relativistic Mechanics.
3. Dilation of Time.
4. Contraction of Length (Lorentz Contraction).
5. Lorentz Transformation.
6. Consequences of Lorentz Transformation. Interval between Events.
7. Transformation of Velocity.
8. Relativistic Dynamics. Relativistic Momentum.
9. Fundamental Equation of Relativistic Dynamics.
10. Kinetic Energy of a Relativistic Particle.
11. Mass-Energy Relation.
12. Elements of Quantum Mechanics. The Unusual Properties of Microparticles.
13. De Broglie's Hypothesis. Wave properties of Matter.
14. The Uncertainty Principle.
15. The Schroedinger Equation.
16. The Schroedinger Equation for Stationary States.
17. The Meaning of the Wave Function.

Literature
1. I. E. Irodov Fundamental Laws of Mechanics, CBS, 2002.
2. I. V. Savelyev Physics. A General Course. Vol. 3. Quantum Optics, Atomic Physics, Solid State Physics, Physics of the Atomic Nucleus and Elementary Particles, Mir Publishers, 1980.
3. M. A. Nielsen, I. L. Chang, Quantum Computation and Quantum Information, Cambridge University, 2010.