**Name of the course:** Physics

**Department responsible for the course or** **equivalent:** Dpt. Physics, Institute of Nanotechnologies, Electronics and Electronic Equipment Engineering

**Lecturer (name, academic title, e-mail):** Dr. Alexandr Gavrilov, professor, [amgavr@sfedu.ru](mailto:amgavr@sfedu.ru), Dr. Sergey Balakirev, assistant professor, [svbalakirev@sfedu.ru](mailto:svbalakirev@sfedu.ru)

**Semester when the course unit is delivered**: 1, 2, 3

**Teaching hours per week**: 5

**Level of course unit**: Bachelor level

**ECTS credits:** 13

**Admission requirements**: During 1-st and 2-nd semesters course «Physics» requires the knowledge and skills formed by a previous base course of physics in secondary school; during 3-rd semester – requires the knowledge and skills formed by the discipline «Mathematics» investigated on the first rate of a bachelor level.

**Course aims**: The discipline of Physics introduces students with basic laws of the physics, forms the knowledge, skills and abilities necessary for studying of the next educational courses and solving problems in professional activity.

The «Physics » course is taught in the 1-st, 2-nd and 3-rd semesters of Bachelor’s program.

**Course contents**:

The course is comprised of 8 units. Each unit ends with a control work.

**The 1-st semester.**

Unit 1: **Mechanics of the material point**

Kinematics. Bases of dynamics. Laws of preservation.

Unit 2: **Solid mechanics. Special relativity**

Dynamics of rotary movement. The law of pulse moment preservation. Kinetic energy of a rotating body. Relativistic mechanics.

Unit 3: **Molecular physics and thermodynamics**

Bases of the molecular-kinetic theory. Statistical distributions. Basic laws of thermodynamics.

**The 2-nd semester.**

Unit 4: **Electrostatics**

Intensity of an electrostatic field. Potential. Energy of an electrostatic field. Dielectrics and conductors in an electrostatic field.

Unit 5: **Electric current. Magnetostatics**

Constant electric current. A magnetic field in vacuum. A magnetic field in substance.

Unit 6: **Electromagnetic induction. Electromagnetic field. Oscillation. Waves**

Electromagnetic induction. Maxwell Equations. Mechanical and electromagnetic fluctuations. Mechanical waves.

**The 3-rd semester.**

Unit 7: **Electromagnetic wave. Wave optics**

Electromagnetic waves. Polarization. An interference. Diffraction. A dispersion.

Unit 8: **Quantum optics. Fundamentals of solid state physics. Atomic structure**

Thermal radiation. Quantum optics. Bases of quantum mechanics. A structure of atom. A structure of a nuclear nucleus. Elementary particles.

**Learning outcomes**: Students will acquaintance with basic laws of physics and opportunities of their application at the decision of the problems, arising in their subsequent professional work.

**Planned learning activities and teaching methods:** Lectures, laboratory works, practical works.

**Assessment methods and criteria**

Assignments for this course consists of: performance of calculate-graphic works, oral interrogation at protection of laboratory works, control work and final exams.

The 1-st semester:

1. Performance of calculate-graphic works during the unit 6%×3 = 18%

2. Oral interrogation at protection of laboratory works during the unit 6%×3 = 18%

3. Control work end of unit 8%×3 = 24%

4. Final exam

The 2-nd semester:

1. Performance of calculate-graphic works during the unit 6%×3 = 18%

2. Oral interrogation at protection of laboratory works during the unit 6%×3 = 18%

3. Control work end of unit 8%×3 = 24%

4. Final exam 40%

The 3-rd semester:

1. Performance of calculate-graphic works during the unit 8%×2 = 16%

2. Oral interrogation at protection of laboratory works during the unit 12%×2 = 24%

3. Control work end of unit 10%×3 = 20%

4. Final exam 40%

**Course literature (recommended or required):**

1. Trofimova T.I. Сourse of physics: Educational manual for engineering specialties. – High schools. - 20 edition, a stereotype. - М.: Academia, 2014. - 558 p.
2. Sivukhin D.V. General course of physics: Educational manual for high schools. In 5 books. – М.: Fizmathlit, 2014 – 544 p.
3. Oseledchik U.S. Physics. Modul course for technical specialties: Educational manual. - М.: Urait, 2010. - 528 p.
4. Сourse of general physics in tasks. – М.: Fizmathlit, 2010. – 268 p.