RĪGAS TEHNISKĀ UNIVERSITĀTE

RTU Course "Physics"

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General data

Code	MFA101
Course title	Physics
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Physics
Responsible instructor	Andris Ozols
Academic staff	Juris Blūms Ilze Klincāre Maija Jansone Visvaldis Vītiņš Aleksandrs Mičko Anželika Blūma Armands Grickus Silvija Lukse Vladimirs Miglāns Daidze Andersone Igors Bužs Dmitrijs Ļitvinovs
Volume of the course: parts and credits points	2 parts, 6.0 Credit Points, 9.0 ECTS credits
Language of instruction	LV, EN
Annotation	The course is intended for students of engineering study programs and is following an high-school physics and university mathematics courses. The course consists of lectures with practical examples and laboratory work. Course provides the theoretical basic knowledge of mechanics, molecular physics and thermodynamics, electromagnetism, wave and quantum optics, quantum mechanics, solid state physics, atomic, nuclear and particle physics. In the frame of the course practical skills of problem solving methods as well as experimental work are acquired.
Goals and objectives of the course in terms of competences and skills	To master the theoretical knowledge and practical skills in physics at university, using elements of higher mathematics. Develop physical and technical perception and logical thinking. Orient the classical physics and the latest breakthroughs in physics and their application of various technical problems, including high-value technology. Able to demonstrate the theoretical physics question the commitment to the practice, as well as being able to solve relatively Standard practical problems in physics. Able to carry out physics experiments, mathematical processing of obtained experimental results, to proceed the analysis of the obtained results and to make conclusions.
Structure and tasks of independent studies	Independent study of textbooks and solution of the practical exercises. The preparation of the theoretical introduction for each laboratory work, the mathematical processing of the laboratory work and concluding reports preparation.
Recommended literature	1. Fizika. Red. A.Valters. Rīga: Zvaigzne, 1992. 643 lpp. 2. Apinis, A. Fizika. Rīga: Zvaigzne, 1972. 706 lpp. 3. Grabovskis, R. Fizika. Rīga: Zvaigzne, 1983. 645 lpp. 4. Hugh D. Young, Roger A. Freedman. University Physics. USA, QC21.2Y67, 2000, 1513 p. 5. Halliday, D., Resnick, R., Walker, J. Fundamental of physics. 8th ed., USA, QC21.3H35, 2008, 1334 p. 6. Volkenšteine, V. Uzdevumu krājums fizikā. Rīga: Zvaigzne, 1968. 353 lpp. 7. Fizikas uzdevumu risināšana. Red. A.Valters. Rīga: Zvaigzne, 1982. 175 lpp. 8. Novērojumu un mērījumu rezultātu matemātiskās apstrādes pamati: metodiski norādījumi laboratorijas darbu veikšanai. Sast. A.Valters, N. Zagorska. Rīga: RTU, 1991. 25 lpp. 9. Uzdevumu krājums vispārīgajā fizikā. M. Jansone, A. Kalnača, J. Blūms u.c. Rīga: RTU, 2000, 247 lpp. 10. Fizikas praktikums tehniskās universitātes studentiem. I. Klincāre, M. Jansone, A. Ķiploka u.c. Rīga: RTU, 2001,189 lpp. 11. Fizikas praktikums tehniskās universitātes studentiem. M. Jansone, I. Klincāre, A. Ķiploka u.c. Rīga: RTU, 2003. 172 lpp. 12.Uzdevumu krājums vispārīgajā fizikā. Red. A. Ozols. Rīga: RTU, 2006. 273 lpp.
Course prerequisites	Physics, chemistry and mathematics in high school level course, Elements of higher mathematics.

Course outline

Theme	Hours
Introduction to the material point and an absolutely rigid body kinematics.	2
Dynamics of material point.	2
Rigid body dynamics.	2
Mechanical oscillations.	2
Mechanical waves.	2

Thermodynamic systems. Ideal gas. The physical basics of molecular kinetic theory.	3
Transfer processes.	1
Basics of thermodynamics.	2
Electric field in a vacuum.	2
Electric field in dielectrics. Conductors in electric field.	2
Direct current. Magnetic field in a vacuum.	2
Magnetic fields of currents.	2
Magnetic field in the substance.	2
Magnetics.	1
Electromagnetic induction.	2
Maxwell’s equations.	2
Electromagnetic oscillations.	3
Electromagnetic waves.	1
Dispersion of the light.	1
Interference of the light.	3
Diffraction of the light.	3
Polarisation of the light.	2
Thermal radiation.	2
External photoelectric effect.	2
Quantum mechanical features.	3
Atomic structure models.	1
Light emission and absorption of atoms.	2
Energy bands formation in crystals.	2
Conductivity of pure and doped semiconductors.	2
The atomic nucleus structure and composition. Radioactivity types.	2
Nuclei and Conservation Laws. Particles.	2
Test (theory).	2
Introduction class for laboratories.	2
The basics of mathematical processing of measurement results.	2
Laboratories.	16
The adoption of Laboratory work reports.	8
Test (practical problems).	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Able to navigate the classical physics topics and issues, as well as the latest achievements of physics.	Test types: tests, home works, written exam. Criteria: able to freely navigate different types of physical regularities.
Able to independently solve the problems of classical physics-standard tasks, the use of higher mathematics.	Test types: tests, home works, written exam. Criteria: Able to take on specific numerical estimates.
Able to independently carry out physics experiments, and to do the mathematical treatment of the obtained results	Test Types: Test lab work. Criteria: Ability to process and quantitatively analyze the experimental results
Able to discern the laws of physics applications in different engineering applications and their implementation in nature and everyday life.	Test types: tests, home works, written exam. Criteria: Able to explain the physics related to natural phenomena and engineering principles for the physical operation of devices.

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	2.0	0.0	1.0		*	
2.	3.0	2.0	0.0	1.0		*	