RĪGAS TEHNISKĀ UNIVERSITĀTE

RTU Course "Physics"

32000 null

General data

Code	MFA105
Course title	Physics
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Juris Blūms
Academic staff	Ilze Klincāre Aleksandrs Mičko Anželika Blūma Armands Grickus Silvija Lukse Vladimirs Miglāns Ainārs Knoks
Volume of the course: parts and credits points	2 parts, 9.0 credits
Language of instruction	LV, EN
Annotation	The study course is intended for students of engineering study programmes and is following high-school physics and university mathematics study courses. The study course consists of lectures with practical examples and laboratory work. The study 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 study 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	The aim of the study course is to provide theoretical knowledge and practical skills in physics at university, using elements of higher mathematics. The tasks of the study course are to develop: 1. physical and technical perception and logical thinking; 2. ability to orient the classical physics and the latest breakthroughs in physics and their application of various technical problems, including high-value technology; 3. skills to demonstrate the theoretical physics question the commitment to the practice, as well as to solve relatively standard practical problems in physics; 4. ability 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	Obligātā/Obligatory: 1. Fizika. Red. A.Valters. Rīga: Zvaigzne, 1992. 643 lpp. 2. Fizikas praktikums tehniskās universitātes studentiem. M.Jansone, I.Klincāre, A.Ķiploka u.c. Rīga: RTU, 2003, 172 lpp. 3. Uzdevumu krājums vispārīgajā fizikā. Red. A.Ozols. Rīga: RTU, 2006, 273.lpp. Papildu/Additional: 1. Apinis, A. Fizika. Rīga: Zvaigzne, 1972. 706 lpp. 2. Grabovskis, R. Fizika. Rīga: Zvaigzne, 1983. 645 lpp. 3. Hugh D. Young, Roger A. Freedman. University Physics. USA, QC21.2Y67, 2000, 1513 p. 4. Halliday, D., Resnick, R., Walker, J. Fundamental of physics. 8th ed., USA, QC21.3H35, 2008, 1334 p. 5. Volkenšteine, V. Uzdevumu krājums fizikā. Rīga: Zvaigzne, 1968. 353 lpp. 6. Fizikas uzdevumu risināšana. Red. A.Valters. Rīga: Zvaigzne, 1982. 175 lpp. 7. Novērojumu un mērījumu rezultātu matemātiskās apstrādes pamati: metodiski norādījumi laboratorijas darbu veikšanai. Sast. A.Valters, N. Zagorska. Rīga: RTU, 1991. 25 lpp. 8. Uzdevumu krājums vispārīgajā fizikā. M. Jansone, A. Kalnača, J. Blūms u.c. Rīga: RTU, 2000, 247 lpp. 9. Fizikas praktikums tehniskās universitātes studentiem. I. Klincāre, M. Jansone, A. Ķiploka u.c. Rīga: RTU, 2001,189 lpp.
Course prerequisites	Physics, chemistry and mathematics in high school level course, elements of higher mathematics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction to the material point and an absolutely rigid body kinematics.	2	2	0	0
Dynamics of material point.	2	2	0	0
Rigid body dynamics.	2	2	0	0
Mechanical oscillations.	2	2	0	0
Mechanical waves.	2	2	0	0
Thermodynamic systems. Ideal gas. The physical basics of molecular kinetic theory.	3	3	0	0

Transfer processes.	1	1	0	0
Basics of thermodynamics.	2	2	0	0
Electric field in a vacuum.	2	2	0	0
Electric field in dielectrics. Conductors in electric field.	2	2	0	0
Direct current. Magnetic field in a vacuum.	2	2	0	0
Magnetic fields of currents.	2	2	0	0
Magnetic field in the substance.	2	2	0	0
Magnetics.	1	1	0	0
Electromagnetic induction.	2	2	0	0
Maxwell's equations.	2	2	0	0
Electromagnetic oscillations.	3	3	0	0
Electromagnetic waves.	1	1	0	0
Dispersion of the light.	1	1	0	0
Interference of the light.	3	3	0	0
Diffraction of the light.	3	3	0	0
Polarisation of the light.	2	2	0	0
Thermal radiation.	2	2	0	0
External photoelectric effect.	2	2	0	0
Quantum mechanical features.	3	3	0	0
Atomic structure models.	1	1	0	0
Light emission and absorption of atoms.	2	2	0	0
Energy bands formation in crystals.	2	2	0	0
Conductivity of pure and doped semiconductors.	2	2	0	0
The atomic nucleus structure and composition. Radioactivity types.	2	2	0	0
Nuclei and Conservation Laws. Particles.	2	2	0	0
Test (theory).	2	2	0	0
Introduction class for laboratories.	2	2	0	0
The basics of mathematical processing of measurement results.	2	2	0	0
Laboratories.	16	16	0	0
The adoption of Laboratory work reports.	32	32	0	0
Test (practical problems).	4	4	0	0
Total:	120	120	0	0

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, homework, 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, homework, 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: laboratory work test. Criteria: able to process and quantitatively analyse 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, homework, written exam. Criteria: able to explain the physics related to natural phenomena and engineering principles for the physical operation of devices.

Evaluation criteria of study results

Criterion	%
Laboratory works	25
Tests	25
Exam	50
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.5	2.0	0.0	1.0		*	
2.	4.5	2.0	0.0	1.0		*	